FCC PART 15E TEST REPORT FOR CERTIFICATION
On Behalf of

AUDIO PRO AB

MULTICONNECTED WIRELESS LOUDSPEAKER

Model Number: A48

FCC ID: 2AGNC-A48

Applicant :	AUDIO PRO AB
Address:	Garnisonsgatan 52, 25466, Helsingborg, Sweden
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2203091
Date of Test:	Jan. 04~Mar. 08, 2022
Date of Report:	Mar. 09, 2022

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
1.3. Information of RF Cable....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....14
2.9. Duty Cycle of Test Signal....15
2.10. Test Equipment List....19
3. 6DB BANDWIDTH &26DB BANDWIDTH & 99% OCCUPIED BANDWIDTH....21
3.1. Limit....21
3.2. Test Setup....21
3.3. Spectrum Analyzer Setting....21
3.4. Test Procedure....22
3.5. Test Result....23
3.6. Test Result....25
4. MAXIMUM CONDUCTED OUTPUT POWER....46
4.1. Limit....46
4.2. Test Setup....46
4.3. Test Procedure....46
4.4. Test Result....47
5. PEAK POWER SPECTRAL DENSITY....49
5.1. Limit....49
5.2. Test Setup....49
5.3. Spectrum Analyzer Setting....49
5.4. Test Procedure....49
5.5. Test Result....50
6. UNWANTED EMISSIONS AND BAND EDGE....76
6.1. Limit....76
6.2. Test Setup....77
6.3. Spectrum Analyzer Setting....78
6.4. Test Procedure....79
6.5. Test Result....80
7. FREQUENCY STABILITY....122
7.1. Limit....122
7.2. Test Setup....122
7.3. Spectrum Analyzer Setting....122

7.4. Test Procedure 123
7.5. Test Result 124
8. AC POWER LINE CONDUCTED EMISSIONS 128
8.1. Limit 128
8.2. Test Setup 128
8.3. Spectrum Analyzer Setting 128
8.4. Test Procedure 128
8.5. Test Result 129
9. ANTENNA REQUIREMENTS 133
9.1. Limit 133
9.2. Test Result 133
10. TEST SETUP PHOTO 134
11. EUT PHOTO 136

EST Technology Co., Ltd.

Applicant: **Address:**	AUDIO PRO AB Garnisonsgatan 52, 25466, Helsingborg, Sweden
Manufacturer: **Address:**	AUDIO PRO AB Garnisonsgatan 52, 25466, Helsingborg, Sweden
Factory: **Address:**	DONGGUAN TRISTAR ELECTRONIC CO., LTD. Building 1& Building2, No. 196, Tangxia Dongxing Road, Tangxia Town, Dongguan City, Guangdong Province, China
E.U.T:	MULTICONNECTED WIRELESS LOUDSPEAKER
Model Number:	A48
Power Supply:	AC 100-120V/220-240V, 50/60Hz
Trade Name:	audio pro Serial No.: ------
Date of Receipt:	Jan. 04, 2022 Date of Test: Jan. 04~Mar. 08, 2022
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. 09, 2022

Prepared by:	Reviewed by:	Approved by:
Emily Cai / Assistant	Seven Wang / 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	:	2AGNC-A48
Product Name	:	MULTICONNECTED WIRELESS LOUDSPEAKER
Model Number	:	A48
Software Version	:	TR1
Hardware Version	:	V1.1
Operation frequency	:	U-NII-1: 5150 MHz~5250 MHz U-NII-2A: 5250 MHz~5350 MHz U-NII-2C: 5470 MHz~5725 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-2A: 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-2C: IEEE 802.11a / n HT20 / ac VHT20: 11 Channels; IEEE 802.11n HT40 / ac VHT40: 5 Channels; IEEE 802.11ac VHT80: 2 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 300Mbps; 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: 15.192dBm IEEE 802.11n HT20: 12.353dBm IEEE 802.11n HT40: 14.310dBm IEEE 802.11ac VHT20: 12.732dBm IEEE 802.11ac VHT40: 14.306dBm IEEE 802.11ac VHT80: 12.494dBm
		U-NII-2A	IEEE 802.11a: 15.257dBm IEEE 802.11n HT20: 14.851dBm IEEE 802.11n HT40: 14.429dBm IEEE 802.11ac VHT20: 14.833dBm IEEE 802.11ac VHT40: 14.440dBm IEEE 802.11ac VHT80: 12.211dBm
		U-NII-2C	IEEE 802.11a: 14.335dBm IEEE 802.11n HT20: 14.105dBm IEEE 802.11n HT40: 13.814dBm IEEE 802.11ac VHT20: 14.073dBm IEEE 802.11ac VHT40: 13.529dBm IEEE 802.11ac VHT80: 11.682dBm
		U-NII-3	IIEEE 802.11a: 14.077dBm IEEE 802.11n HT20: 13.877dBm IEEE 802.11n HT40: 13.005dBm IEEE 802.11ac VHT20: 13.826dBm IEEE 802.11ac VHT40: 13.257dBm IEEE 802.11ac VHT80: 11.944dBm
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	-	-	Internal	-	2
2	-	-	Internal	-	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.
(3) This information is provided by the applicant.

ANT No. / TX Mode	SISO Configuration	MIMO Configuration
IEEE 802.11a	ANT 1 and ANT 2	/
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

1.3. Information of RF Cable

Cable Loss(dB)	Provided by
1.0	AUDIO PRO AB
Note: 1.The customer declared the loss value of the RF Cable, and the test results of this report only apply to the sample as received. 2. This information is provided by the applicant.	

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)(9)	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 This Certificate is valid until: November 12, 2023 Certificated by FCC, USA Designation Number: CN1215 This Certificate is valid until: January 31, 2024 Certificated by A2LA, USA Registration No.: 4366.01 This Certificate is valid until: January 31, 2024 Certificated by Industry Canada CAB identifier No.: CN0035 This Certificate is valid until: January 31, 2024 Certificated by VCCI, Japan Registration No.:C-14103; T-20073; R-13663; R-20103; G-20097 Date of registration: Apr. 20, 2020 This Certificate is valid until: Apr. 19, 2023 Certificated by TUV Rheinland, Germany Registration No.: UA 50413872 0001 Date of registration: July 31, 2018 Certificated by Intertek Registration No.: 2011-RTL-L2-64 Date of registration: November 08, 2018
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 spurious emissions test (Below 30MHz)	±1.62 dB
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	1.08dB
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.

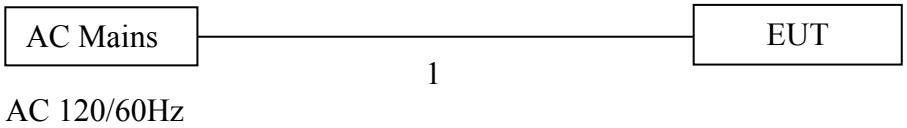
2.4. Assistant equipment used for test

Item	Equipment	Brand	Model Name/Type No.	FCC ID	Series No.
-	-	-	-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.8m	AC 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 120/60Hz

(EUT: MULTICONNECTED WIRELESS LOUDSPEAKER)

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	36/40/48/52/60/64/100/116/140	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/52/60/64/100/116/140	OFDM	MCS0
	IEEE 802.11n HT40	38/46/54/62/102/114/134	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/52/60/64/100/116/140	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/54/62/102/114/134	OFDM	MCS0
	IEEE 802.11ac VHT80	42/58/106/122	OFDM	MCS0
99% Occupied Bandwidth	IEEE 802.11a	36/40/48/52/60/64/100/116/140/ 149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/52/60/64/100/116/140/ 149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/52/60/64/100/116/140/ 149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/58/106/122/155	OFDM	MCS0
Maximum Conducted Output Power	IEEE 802.11a	36/40/48/52/60/64/100/116/140/ 149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/52/60/64/100/116/140/ 149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/52/60/64/100/116/140/ 149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/54/62/102/114/134/151/ 159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/58/106/122/155	OFDM	MCS0

Peak Power Spectral Density	IEEE 802.11a	36/40/48/52/60/64/100/116/140/149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/52/60/64/100/116/140/149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/52/60/64/100/116/140/149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/58/106/122/155	OFDM	MCS0
Unwanted Emissions and Band Edge(Above 1GHz)	IEEE 802.11a	36/40/48/52/60/64/100/116/140/149/157/165	OFDM	6Mbps
	IEEE 802.11n HT20	36/40/48/52/60/64/100/116/140/149/157/165	OFDM	MCS0
	IEEE 802.11n HT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT20	36/40/48/52/60/64/100/116/140/149/157/165	OFDM	MCS0
	IEEE 802.11ac VHT40	38/46/54/62/102/114/134/151/159	OFDM	MCS0
	IEEE 802.11ac VHT80	42/58/106/122/155	OFDM	MCS0
Unwanted Emissions Below 1GHz	IEEE 802.11a	100	OFDM	6Mbps
Frequency Stability	Unmodulation	36/64/100/149	N/A	N/A
AC Power Line Conducted Emissions	IEEE 802.11a	100	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-2A	IEEE 802.11a & n HT20 & ac VHT20	52	5260
		56	5280
		60	5300
		64	5320
	IEEE 802.11n HT40 & ac VHT40	54	5270
		62	5310
	IEEE 802.11ac VHT80	58	5290
U-NII-2C	IEEE 802.11a & n HT20 & ac VHT20	100	5500
		104	5520
		108	5540
		112	5560
		116	5580
		120	5600
		124	5620
		128	5640
		132	5660
		136	5680
		140	5700
	IEEE 802.11n HT40 & ac VHT40	102	5510
		110	5550
		118	5590
		126	5630
		134	5670
	IEEE 802.11ac VHT80	106	5530
		122	5610
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	ADB		
U-NII-1			
Frequency(MHz)	5180	5200	5240
IEEE 802.11a Setting	19	19	19
IEEE 802.11n HT20 Setting	17	17	17
IEEE 802.11ac VHT20 Setting	17	17	17
Frequency(MHz)	5190	5230	
IEEE 802.11n HT40 Setting	19	19	
IEEE 802.11ac VHT40 Setting	19	19	
Frequency(MHz)	5210		
IEEE 802.11ac VHT80 Setting	19		
U-NII-2A			
Frequency(MHz)	5260	5300	5320
IEEE 802.11a Setting	19	19	19
IEEE 802.11n HT20 Setting	19	19	19
IEEE 802.11ac VHT20 Setting	19	19	19
Frequency(MHz)	5270	5310	
IEEE 802.11n HT40 Setting	19	19	
IEEE 802.11ac VHT40 Setting	19	19	
Frequency(MHz)	5290		
IEEE 802.11ac VHT80 Setting	19		
U-NII-2C			
Frequency(MHz)	5500	5580	5700
IEEE 802.11a Setting	19	19	19
IEEE 802.11n HT20 Setting	19	19	19
IEEE 802.11ac VHT20 Setting	19	19	19
Frequency(MHz)	5510	5670	
IEEE 802.11n HT40 Setting	19	19	
IEEE 802.11ac VHT40 Setting	19	19	
Frequency(MHz)	5530	5610	
IEEE 802.11ac VHT80 Setting	19	19	
U-NII-3			
Frequency(MHz)	5745	5785	5825
IEEE 802.11a Setting	19	19	19
IEEE 802.11n HT20 Setting	19	19	19
IEEE 802.11ac VHT20 Setting	19	19	19
Frequency(MHz)	5755	5795	
IEEE 802.11n HT40 Setting	19	19	
IEEE 802.11ac VHT40 Setting	19	19	
Frequency(MHz)	5775		
IEEE 802.11ac VHT80 Setting	19		

Note: This information is provided by the applicant.

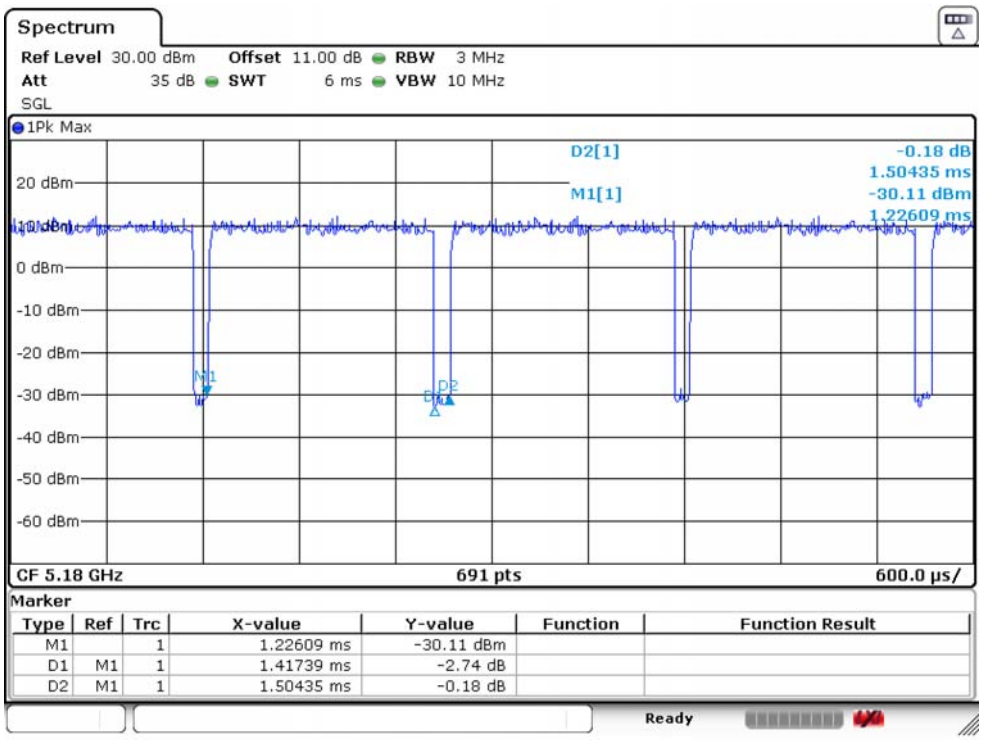
2.9. Duty Cycle of Test Signal

Temperature	25℃	Relative Humidity		51%	Test Voltage	AC 120V/60Hz
Mode	Frequency (MHz)	On time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T (Hz)
IEEE 802.11a	5180	1.41739	1.50435	94.22	0.26	706
IEEE 802.11n HT20	5180	1.33043	1.41739	93.86	0.27	752
IEEE 802.11ac VHT20	5190	1.34783	1.42609	94.51	0.25	742
IEEE 802.11n HT40	5180	0.66957	0.73913	90.59	0.43	1493
IEEE 802.11ac VHT40	5190	0.66957	0.75652	88.51	0.53	1493
IEEE 802.11ac VHT80	5210	0.34783	0.43478	80.00	0.97	2875

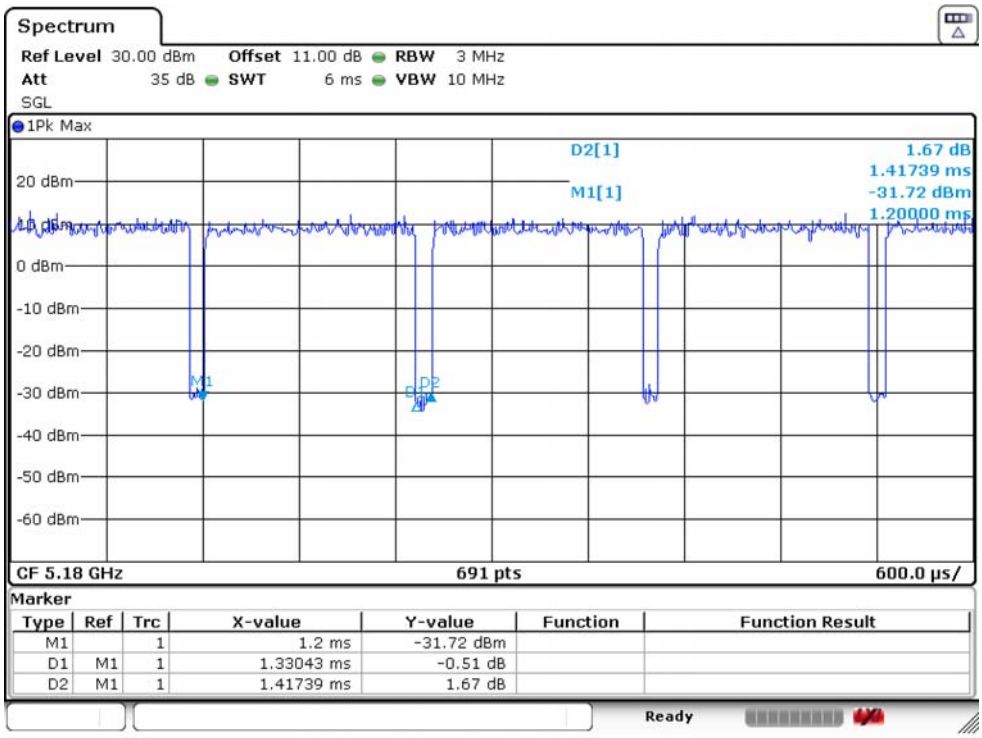
Note:

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.

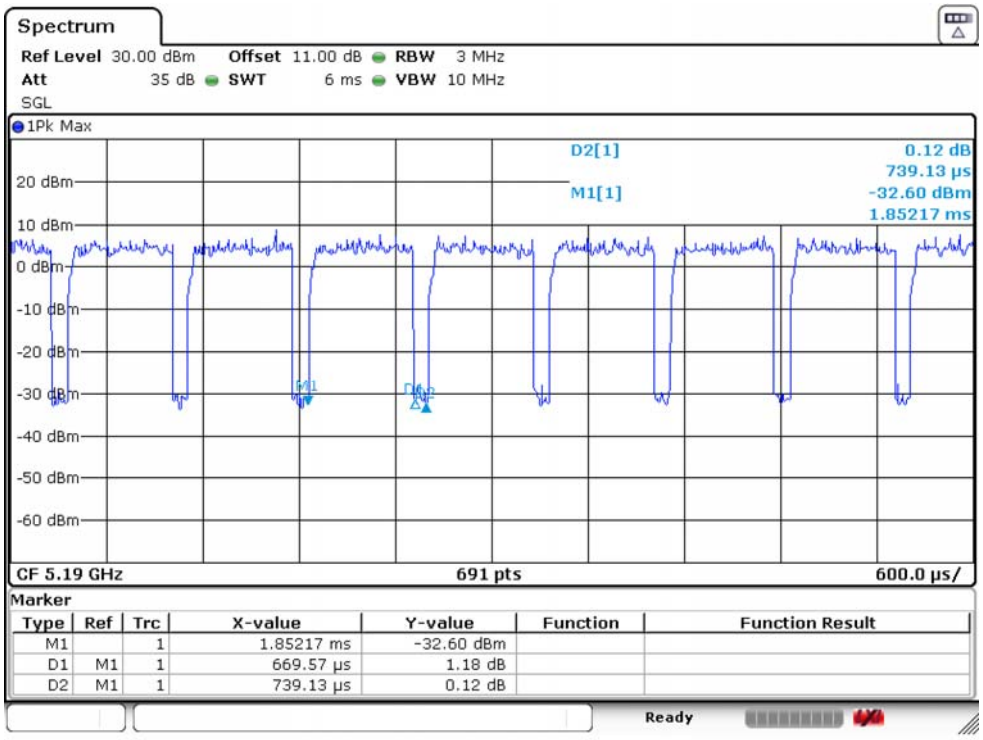
IEEE 802.11a 5180MHz



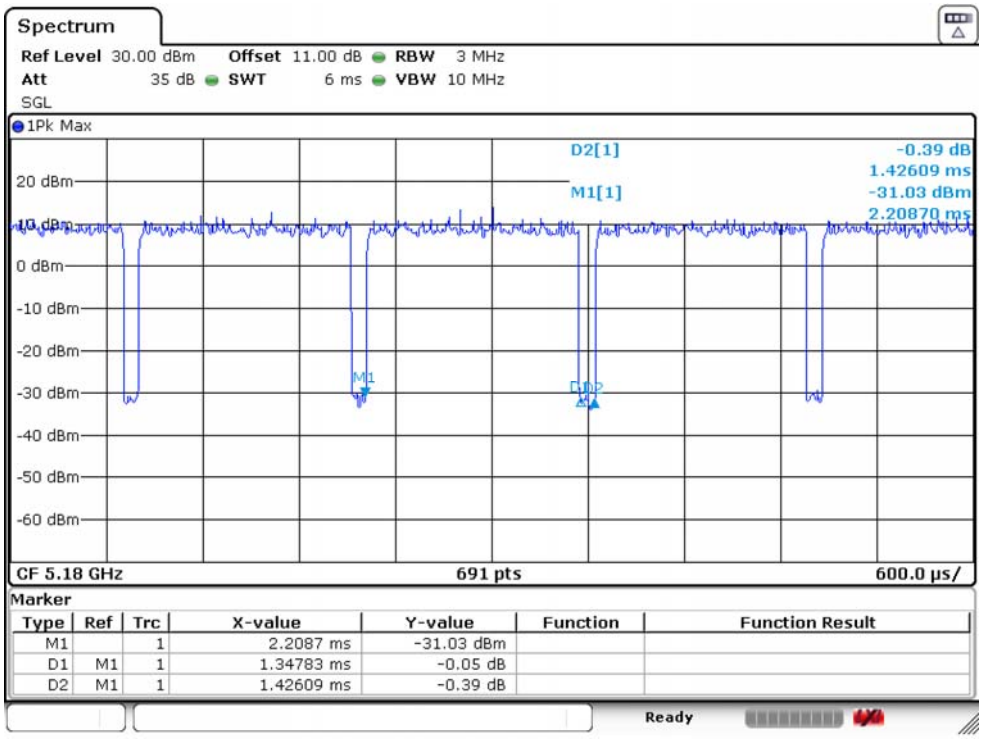
IEEE 802.11n HT20 5180MHz



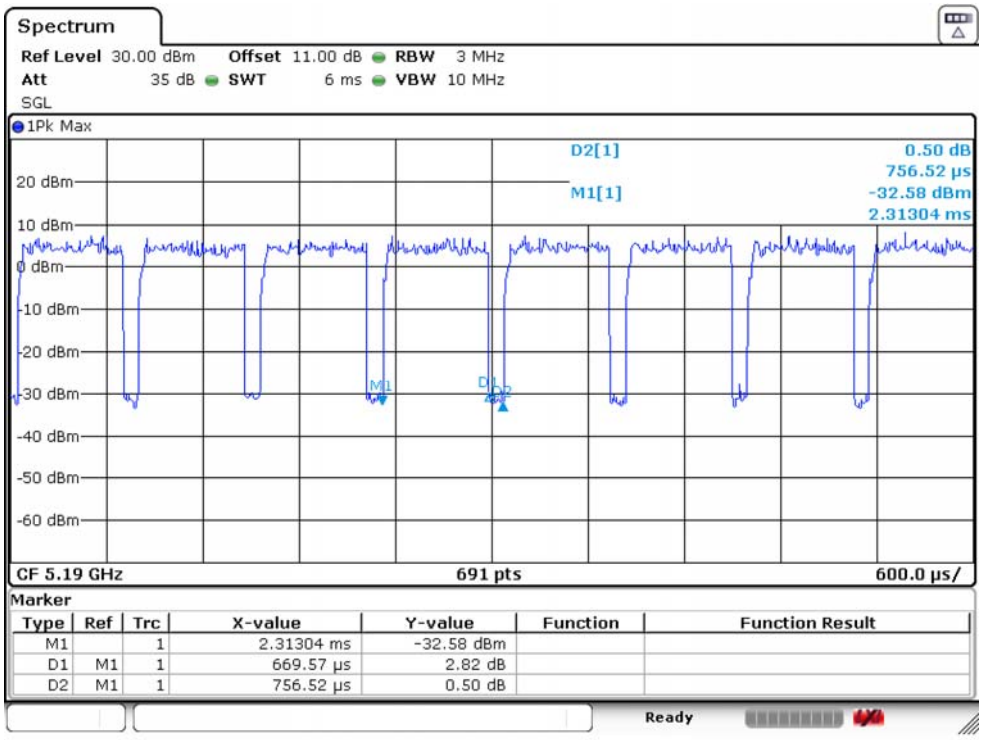
IEEE 802.11n HT40 5190MHz



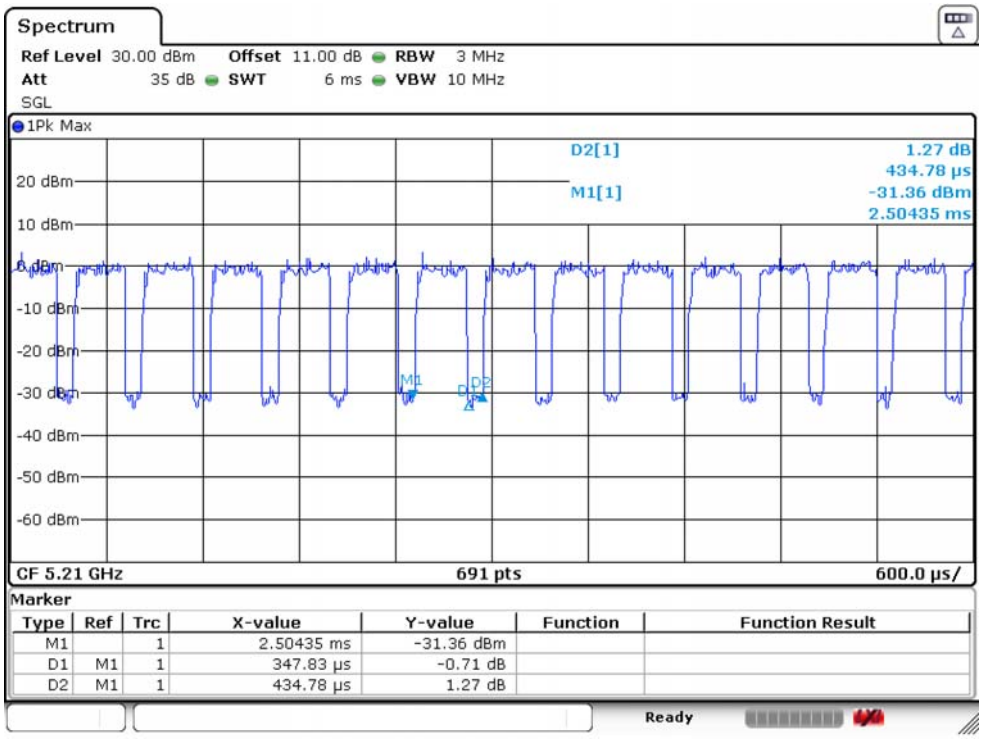
IEEE 802.11ac VHT20 5180MHz



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 13,21	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	EST-E002	LISAI	June 13,21	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	EST-E078	LISAI	June 13,21	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 13,21	1 Year
Active Loop Antenna	SCHWAREB ECK	FMZB 1519B	EST-E054	LISAI	June 13,21	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 13,21	1 Year
Bilog Antenna	Teseq	CBL 6111D	EST-E034	LISAI	June 13,21	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 13,21	1 Year
Signal Amplifier	SCHWARZB ECK	BBV9718	EST-E032	LISAI	June 13,21	1 Year
Spectrum Analyzer	Rohde &Schwarz	FSV40	EST-E069	LISAI	July 19,21	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

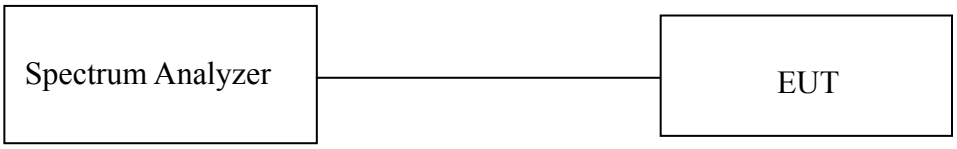
For connect EUT antenna terminal test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
TS 8997	Rohde &Schwarz	/	/	/	/	/
Open Switch and Control Unit	Rohde &Schwarz	OSP-B157WB	EST-E036	LISAI	June 13,21	1Year
Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	EST-E037	LISAI	June 13,21	1 Year
Signal Generator	Rohde &Schwarz	SMB100A	EST-E038	LISAI	June 13,21	1 Year
Vector Signal Generator	Rohde &Schwarz	SMBV100A	EST-E039	LISAI	June 13,21	1Year
Test Software	Rohde &Schwarz	WMS32	V10.50.00	N/A	N/A	N/A
Temperature controller	Terchy	MHQ	EST-E101	LISAI	June 13,21	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	25℃	Relative Humidity	51%	Test Voltage	AC 120V/60Hz

26dB Bandwidth&99% Occupied Bandwidth

AND	Test Mode	Fre (MHz)	26dB Bandwidth (MHz)	99% Occupied Bandwidth（MHz）	Calculate Power Limit (W)	Calculate Power Limit (dBm)
U-NII-1	IEEE 802.11a	5180	21.592	16.983		
		5200	21.360	16.983		
		5240	21.302	16.983		
	IEEE 802.11n HT20	5180	21.534	18.062		
		5200	21.418	17.942		
		5240	20.955	17.982		
	IEEE 802.11ac VHT20	5180	21.708	18.117		
		5200	21.650	18.177		
		5240	21.766	18.003		
	IEEE 802.11n HT40	5190	40.060	36.700		
		5230	40.170	36.700		
	IEEE 802.11ac VHT40	5190	40.290	36.816		
		5230	40.170	36.700		
	IEEE 802.11ac VHT80	5210	81.740	75.716		
U-NII-2A	IEEE 802.11a	5260	21.708	17.019	0.2500	23.98
		5300	21.245	16.961	0.2500	23.98
		5320	21.187	16.903	0.2500	23.98
	IEEE 802.11n HT20	5260	21.592	17.945	0.2500	23.98
		5300	21.187	17.887	0.2500	23.98
		5320	21.650	17.887	0.2500	23.98
	IEEE 802.11ac VHT20	5260	21.592	17.945	0.2500	23.98
		5300	21.476	17.887	0.2500	23.98
		5320	21.476	18.003	0.2500	23.98
	IEEE 802.11n HT40	5270	40.170	36.932	0.2500	23.98
		5310	40.170	36.932	0.2500	23.98
	IEEE 802.11ac VHT40	5270	39.940	36.700	0.2500	23.98
		5310	40.170	36.700	0.2500	23.98
	IEEE 802.11ac VHT80	5290	81.970	75.948	0.2500	23.98

Temperature	24.7℃	Relative Humidity	53%	Test Voltage	120V/60 Hz

26dB Bandwidth&99% Occupied Bandwidth

AND	Test Mode	Fre (MHz)	26dB Bandwidth (MHz)	99% Occupied Bandwidth（MHz）	Calculate Power Limit (W)	Calculate Power Limit (dBm)
U-NII-2C	IEEE 802.11a	5500	21.708	16.787	0.2500	23.98
		5580	21.360	16.787	0.2500	23.98
		5700	21.476	16.787	0.2500	23.98
	IEEE 802.11n HT20	5500	21.823	18.177	0.2500	23.98
		5580	21.245	18.003	0.2500	23.98
		5700	21.245	17.887	0.2500	23.98
	IEEE 802.11ac VHT20	5500	21.650	18.003	0.2500	23.98
		5580	21.592	17.945	0.2500	23.98
		5700	21.013	17.887	0.2500	23.98
	IEEE 802.11n HT40	5510	39.830	36.585	0.2500	23.98
		5670	40.290	36.700	0.2500	23.98
	IEEE 802.11ac VHT40	5510	40.170	36.700	0.2500	23.98
		5670	40.170	36.585	0.2500	23.98
	IEEE 802.11ac VHT80	5530	40.060	36.700	0.2500	23.98
		5610	40.170	36.700	0.2500	23.98

Temperature	25℃	Relative Humidity	51%	Test Voltage	AC 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
U-NII-3	IEEE 802.11a	5745	16.344	16.863	0.5	PASS
		5785	16.344	16.983	0.5	PASS
		5825	16.344	16.783	0.5	PASS
	IEEE 802.11n HT20	5745	17.542	17.902	0.5	PASS
		5785	17.542	18.022	0.5	PASS
		5825	17.582	17.902	0.5	PASS
	IEEE 802.11ac VHT20	5745	17.582	17.889	0.5	PASS
		5785	17.542	18.061	0.5	PASS
		5825	17.622	17.887	0.5	PASS
	IEEE 802.11n HT40	5755	36.044	36.816	0.5	PASS
		5795	36.044	36.700	0.5	PASS
	IEEE 802.11ac VHT40	5755	36.044	36.816	0.5	PASS
		5795	36.044	36.700	0.5	PASS
	IEEE 802.11ac VHT80	5775	75.440	75.485	0.5	PASS

Note :

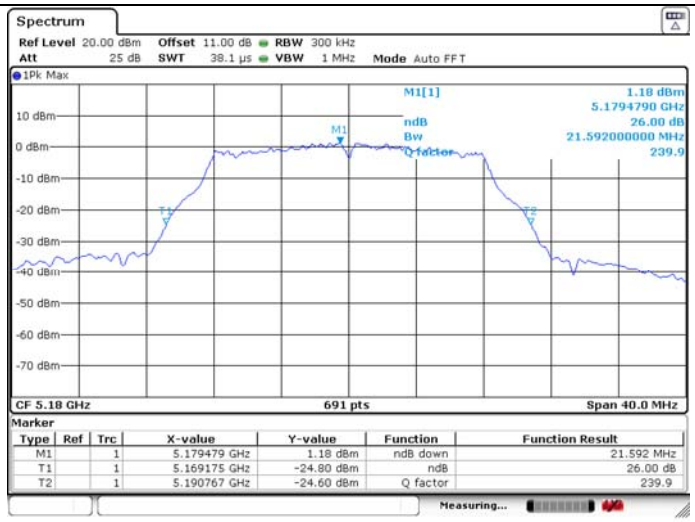
For Band U-NII-2A and U-NII-2C,the maximum conducted output power limit is 250mw or 11+10×Log B, which is lesser,where B is the 26dB Bandwidth in MHz.So in this section,the maximum conducted output power limit can calculate with 26dB Bandwidth.

Note: Ant1 and ANT2 both have tests, and the report only shows the data for the worst case Ant1.

3.6. Test Result

U-NII-1 IEEE 802.11a 5180MHz

26dB Bandwidth

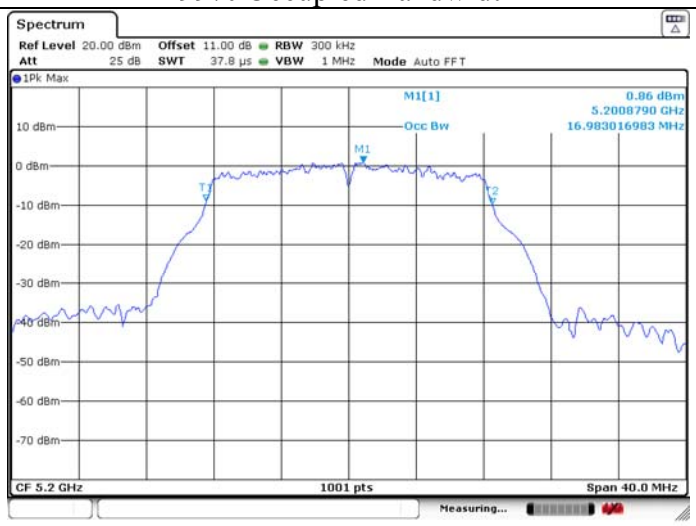


99% Occupied Bandwidth

U-NII-1 IEEE 802.11a 5200MHz

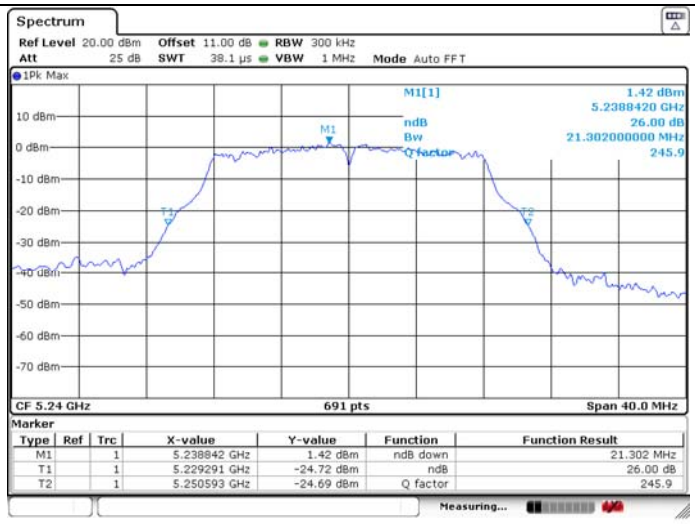
26dB Bandwidth

99% Occupied Bandwidth

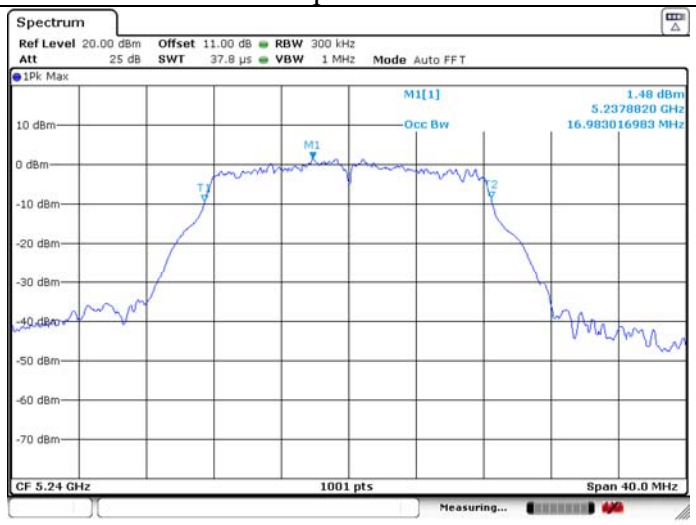


U-NII-1 IEEE 802.11a 5240MHz

26dB Bandwidth

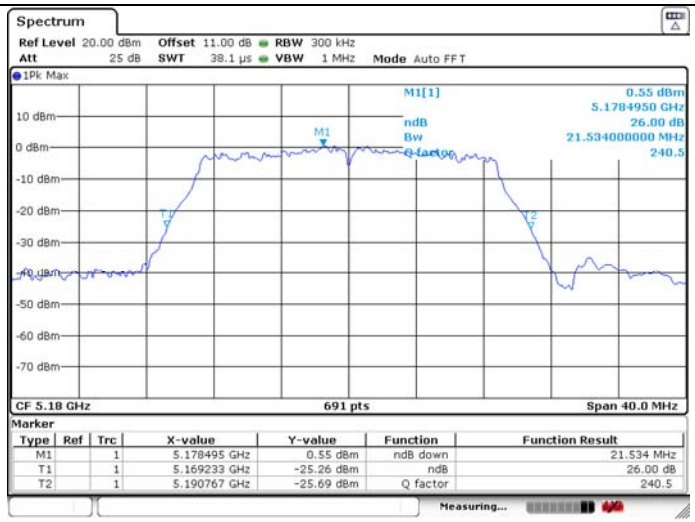


99% Occupied Bandwidth



U-NII-1 IEEE 802.11n HT20 5180MHz

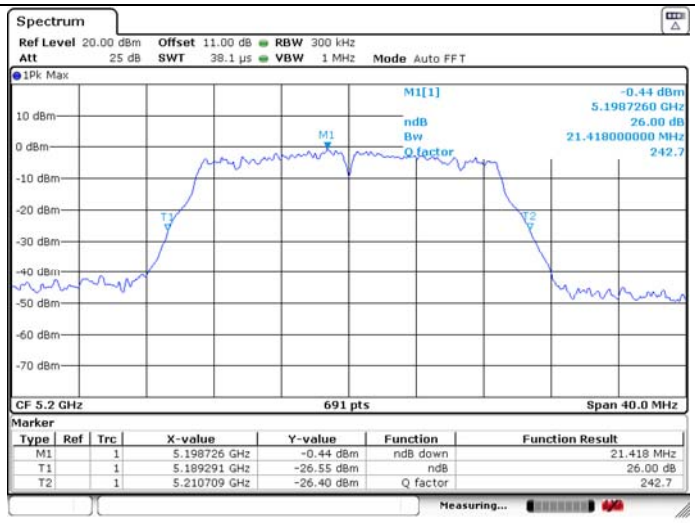
26dB Bandwidth



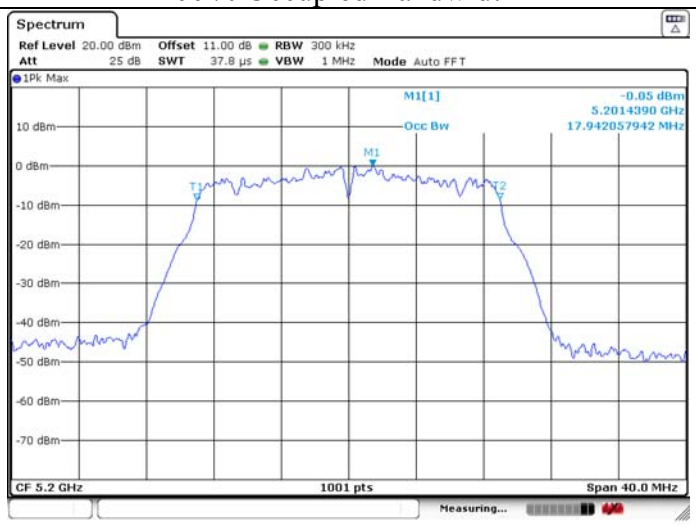
99% Occupied Bandwidth

U-NII-1 IEEE 802.11n HT20 5200MHz

26dB Bandwidth

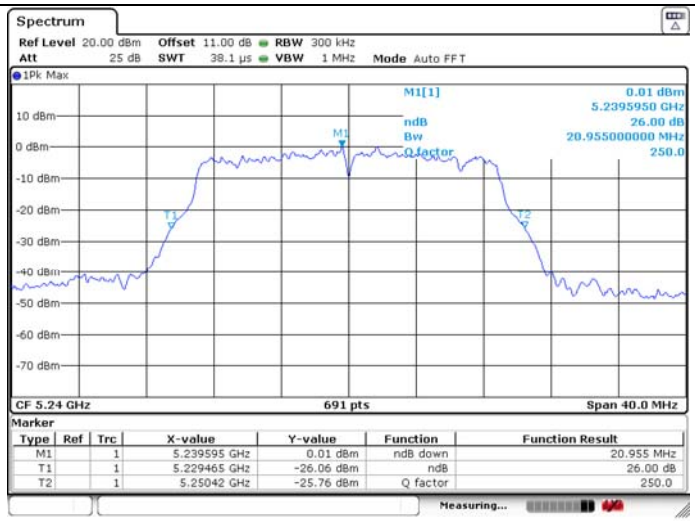


99% Occupied Bandwidth

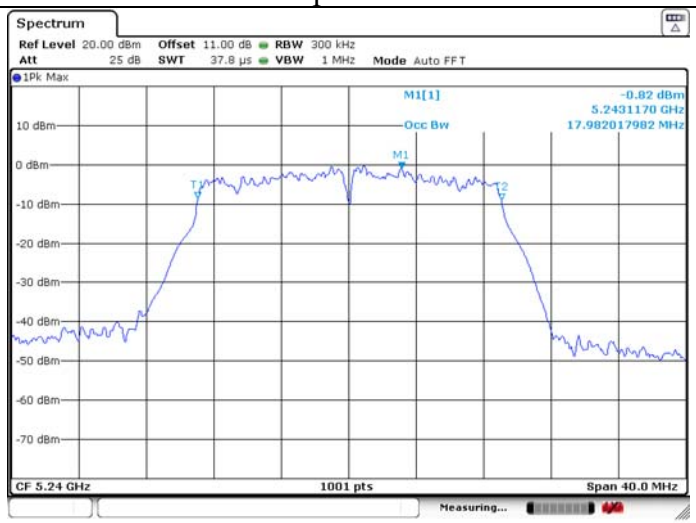


U-NII-1 IEEE 802.11n HT20 5240MHz

26dB Bandwidth

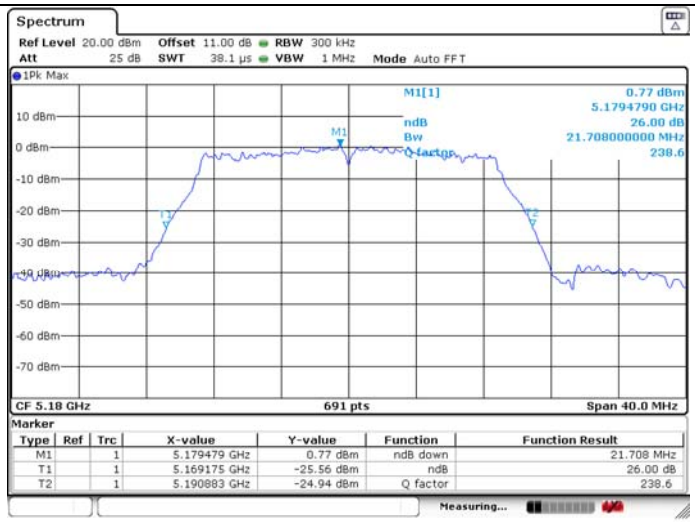


99% Occupied Bandwidth



U-NII-1 IEEE 802.11ac VHT20 5180MHz

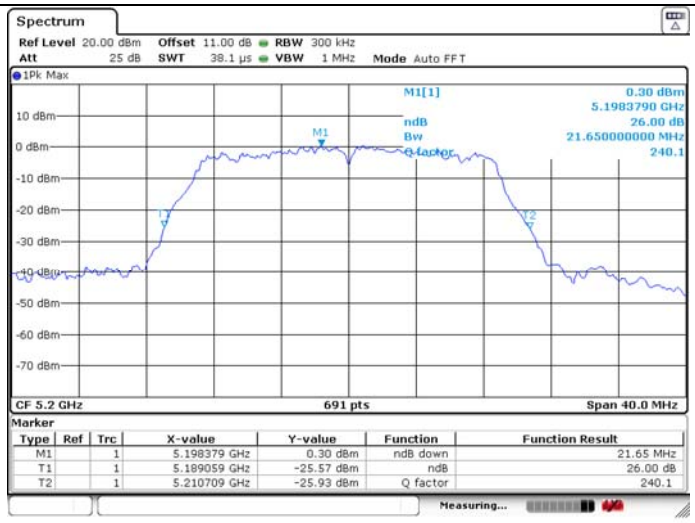
26dB Bandwidth



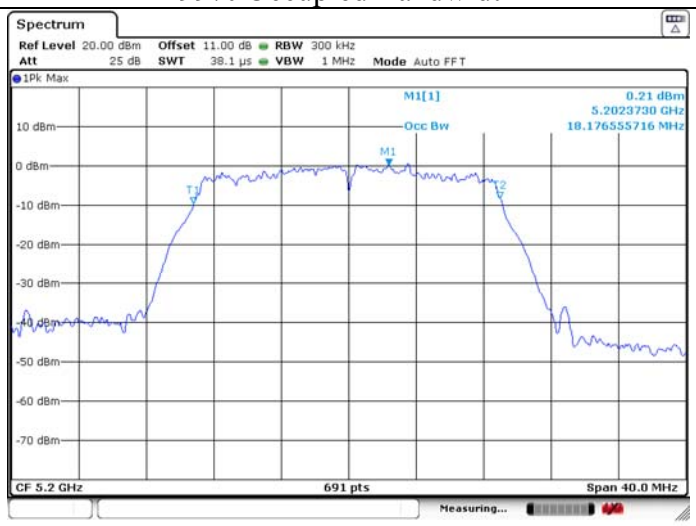
99% Occupied Bandwidth

U-NII-1 IEEE 802.11ac VHT20 5200MHz

26dB Bandwidth

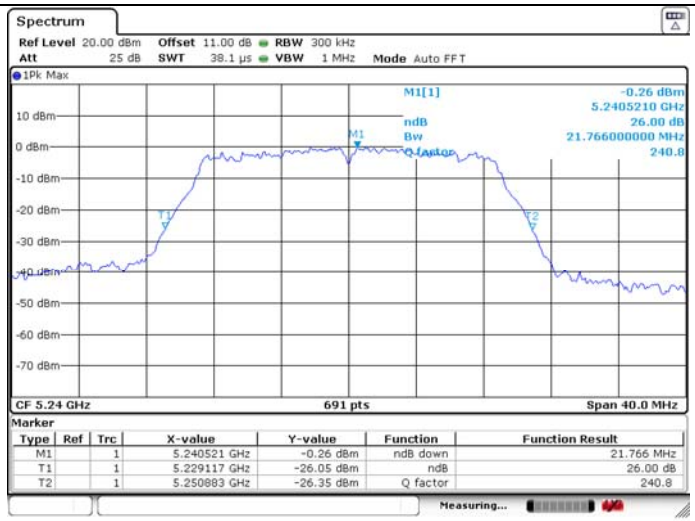


99% Occupied Bandwidth

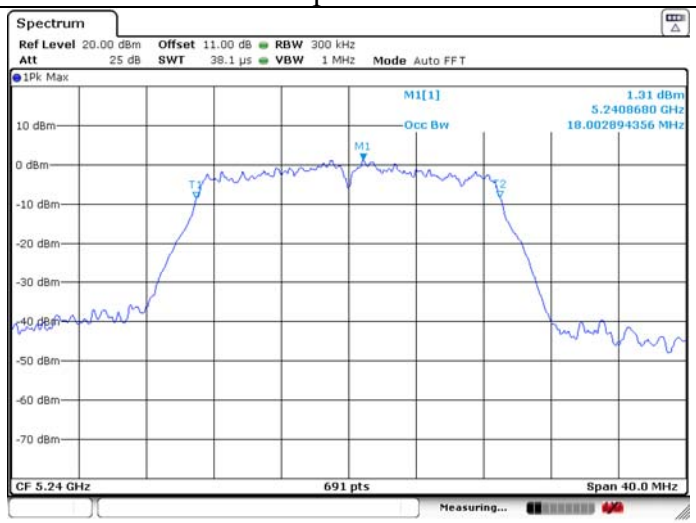


U-NII-1 IEEE 802.11ac VHT20 5240MHz

26dB Bandwidth

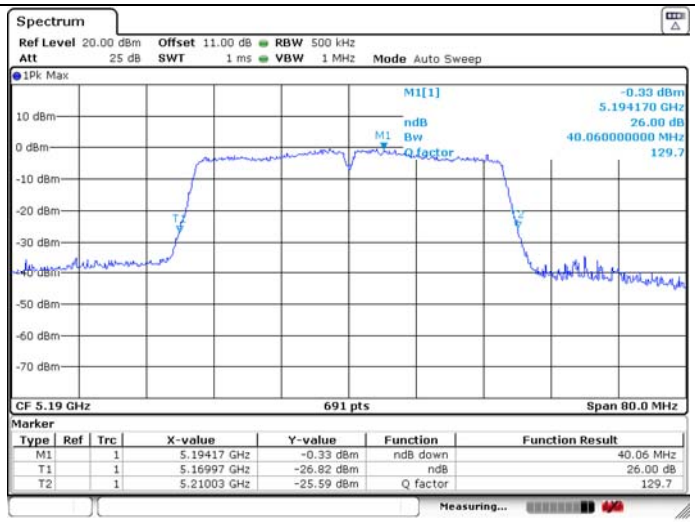


99% Occupied Bandwidth

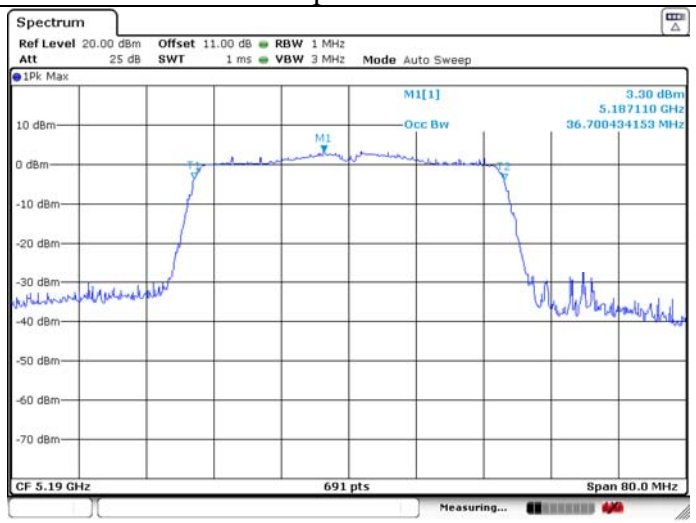


U-NII-1 IEEE 802.11n HT40 5190MHz

26dB Bandwidth

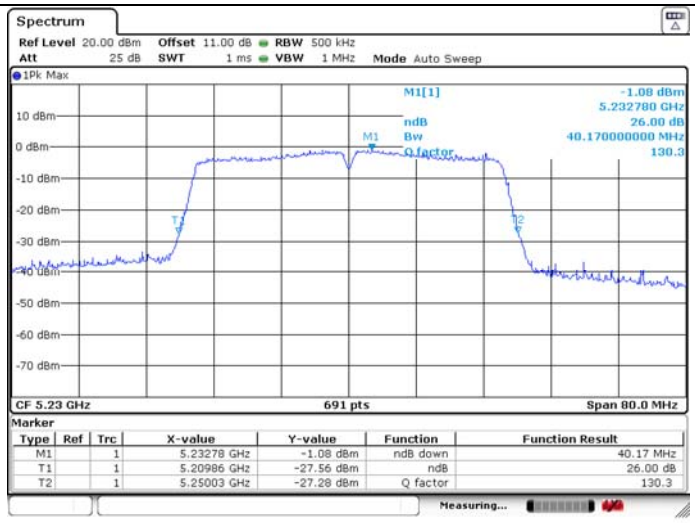


99% Occupied Bandwidth

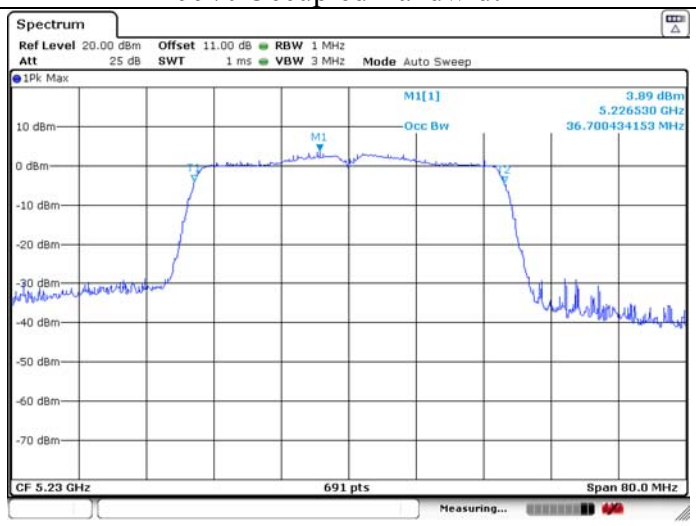


U-NII-1 IEEE 802.11n HT40 5230MHz

26dB Bandwidth

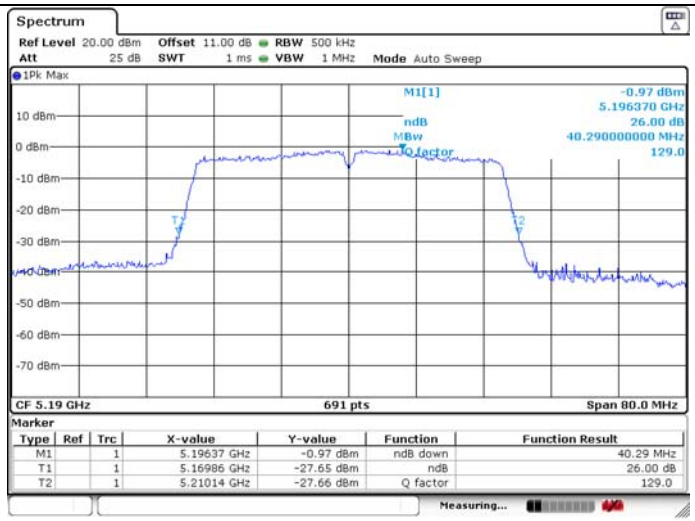


99% Occupied Bandwidth

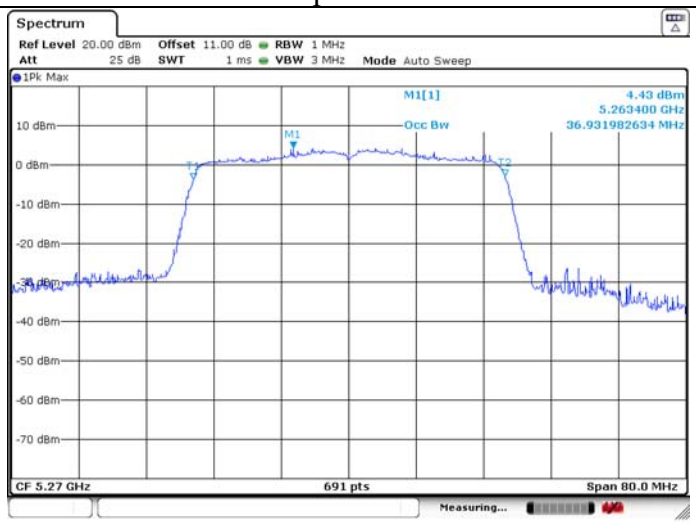


U-NII-1 IEEE 802.11ac VHT40 5190MHz

26dB Bandwidth

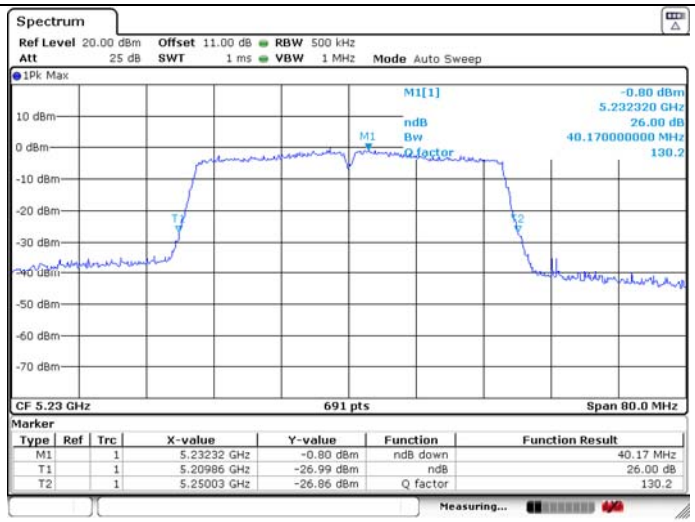


99% Occupied Bandwidth

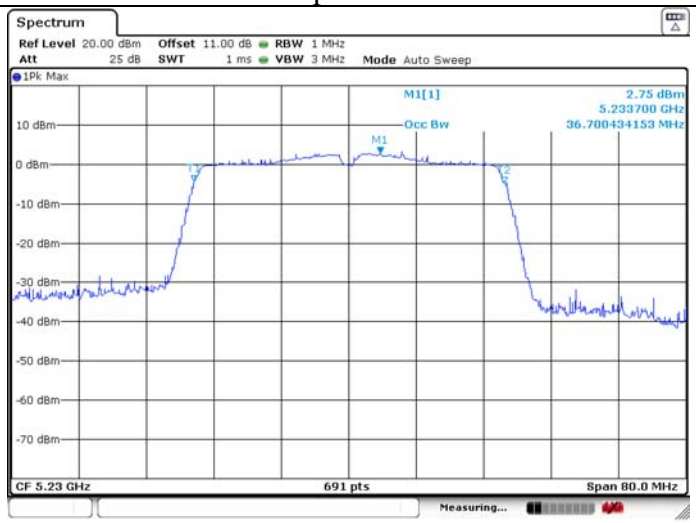


U-NII-1 IEEE 802.11ac VHT40 5230MHz

26dB Bandwidth

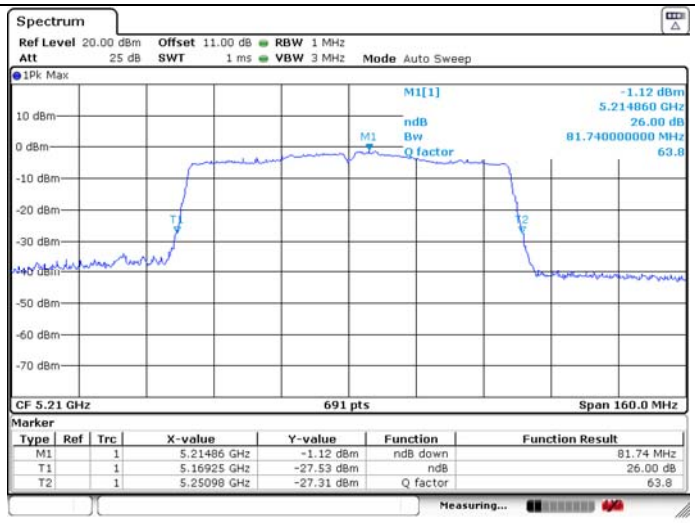


99% Occupied Bandwidth

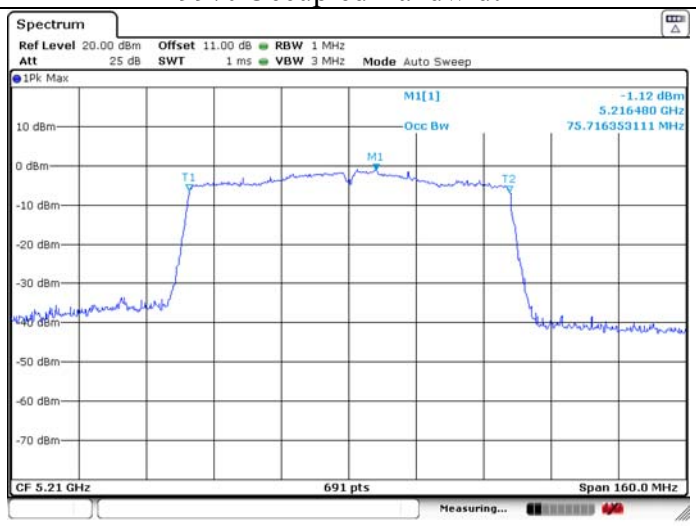


U-NII-1 IEEE 802.11ac VHT80 5210MHz

26dB Bandwidth

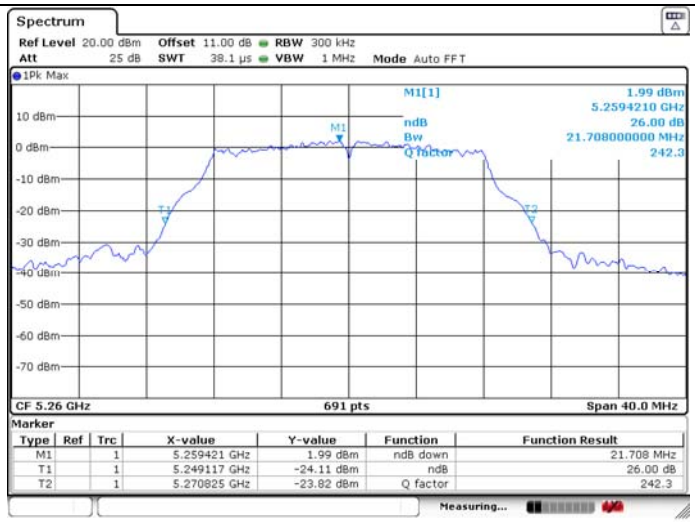


99% Occupied Bandwidth



U-NII-2A IEEE 802.11a 5260MHz

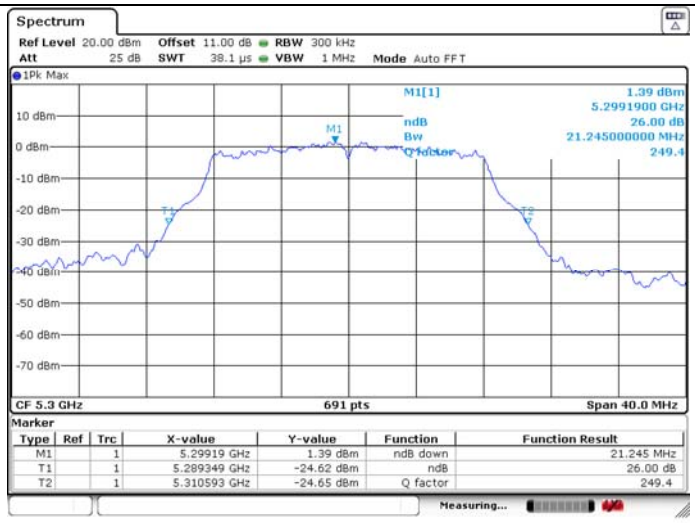
26dB Bandwidth



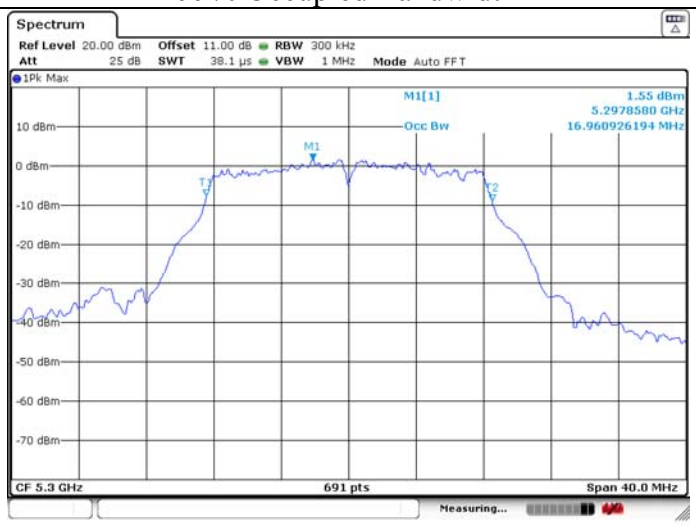
99% Occupied Bandwidth

U-NII-2A IEEE 802.11a 5300MHz

26dB Bandwidth

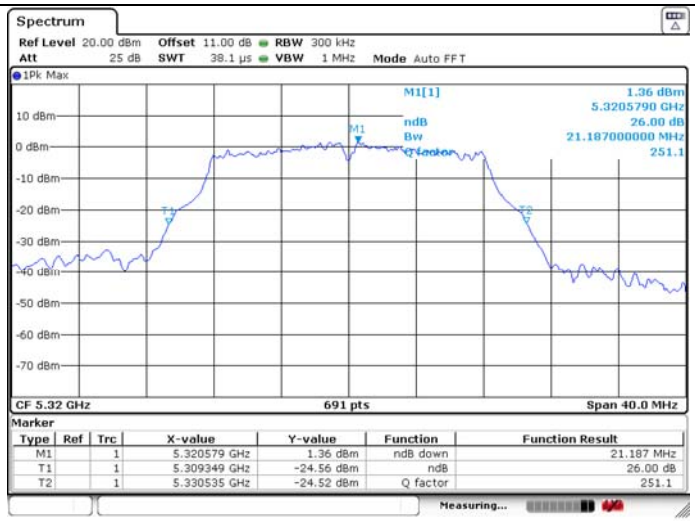


99% Occupied Bandwidth

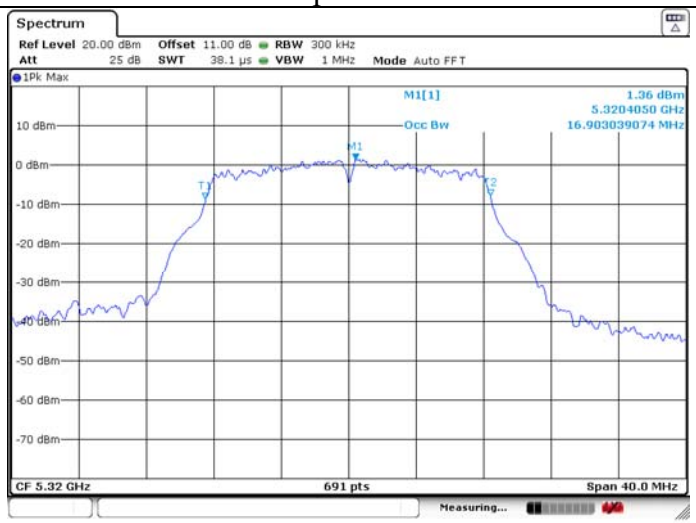


U-NII-2A IEEE 802.11a 5320MHz

26dB Bandwidth

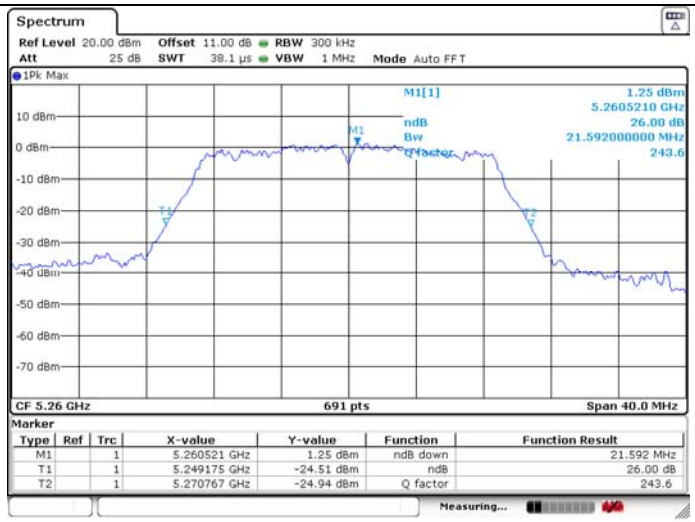


99% Occupied Bandwidth



U-NII-2A IEEE 802.11n HT20 5260MHz

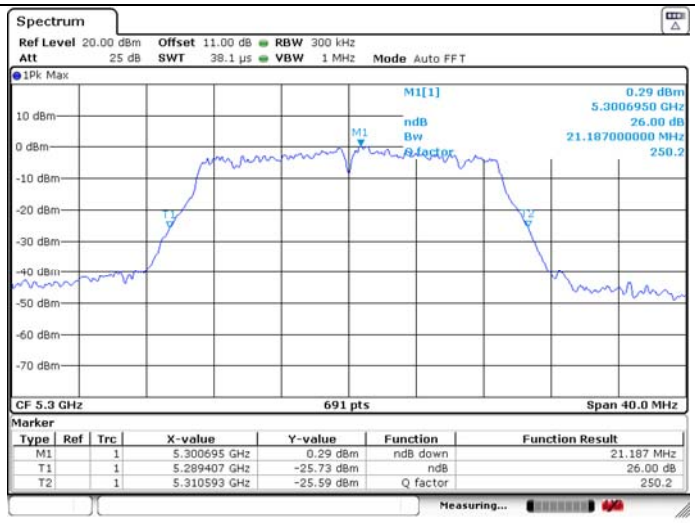
26dB Bandwidth



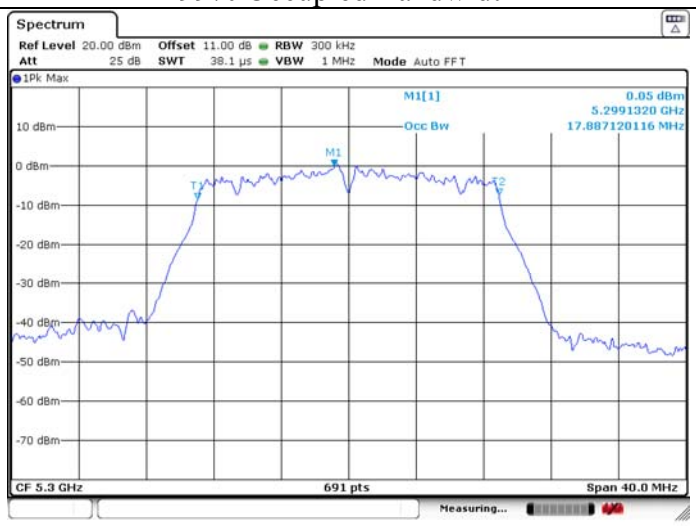
99% Occupied Bandwidth

U-NII-2A IEEE 802.11n HT20 5300MHz

26dB Bandwidth

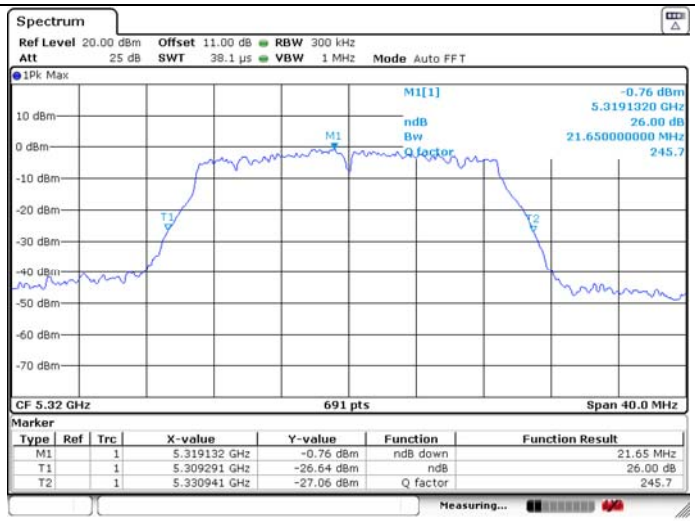


99% Occupied Bandwidth

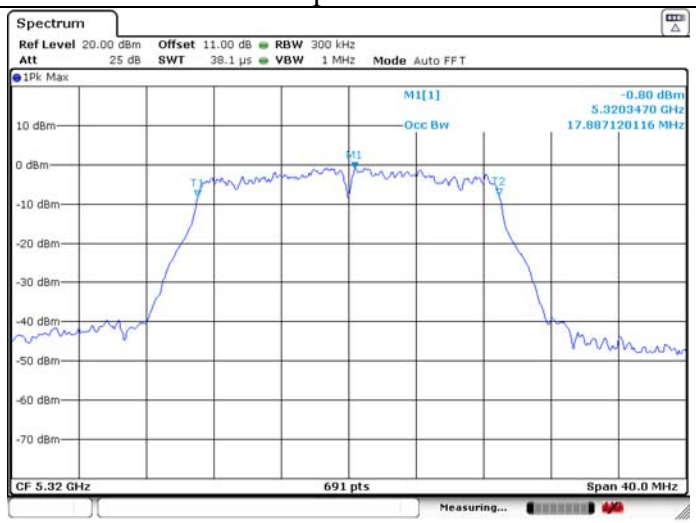


U-NII-2A IEEE 802.11n HT20 5320MHz

26dB Bandwidth

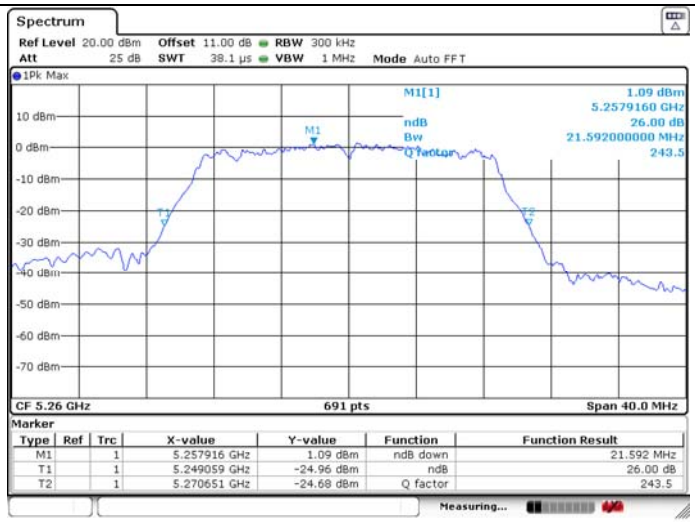


99% Occupied Bandwidth

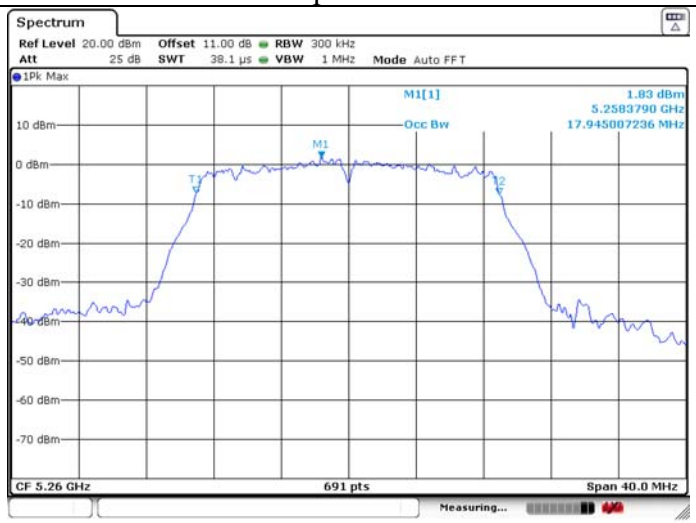


U-NII-2A IEEE 802.11ac VHT20 5260MHz

26dB Bandwidth

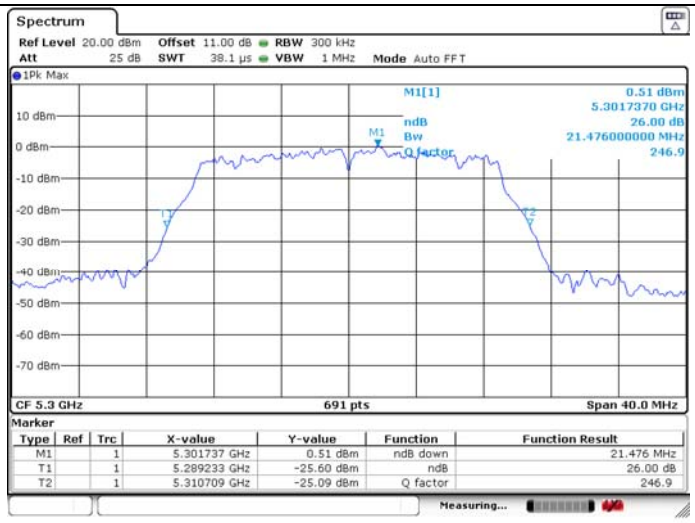


99% Occupied Bandwidth

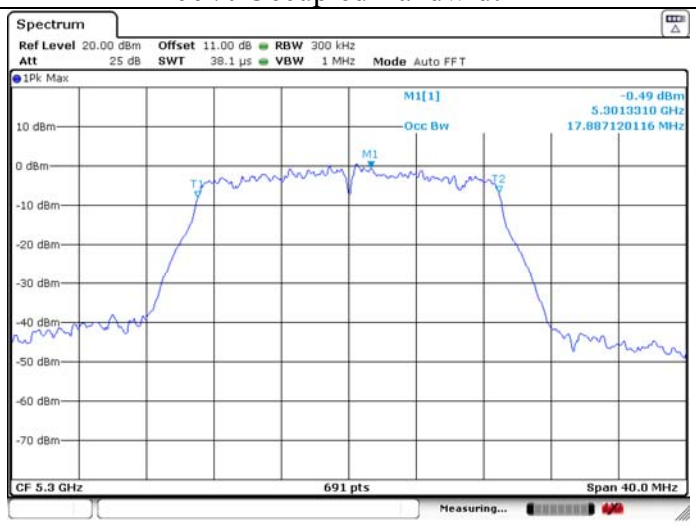


U-NII-2A IEEE 802.11ac VHT20 5300MHz

26dB Bandwidth

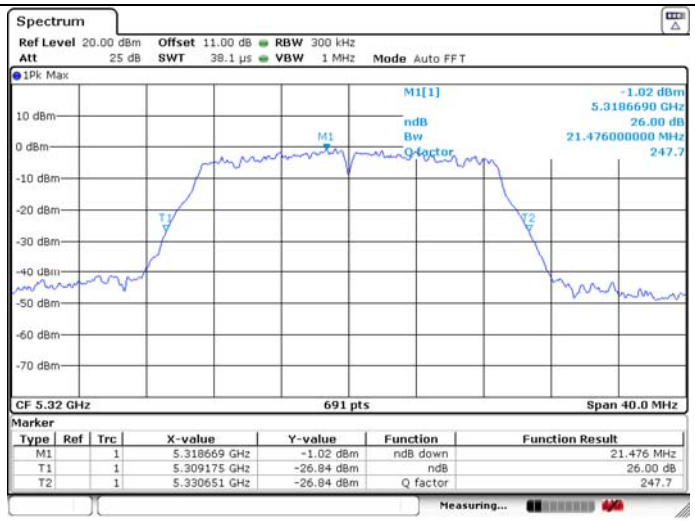


99% Occupied Bandwidth

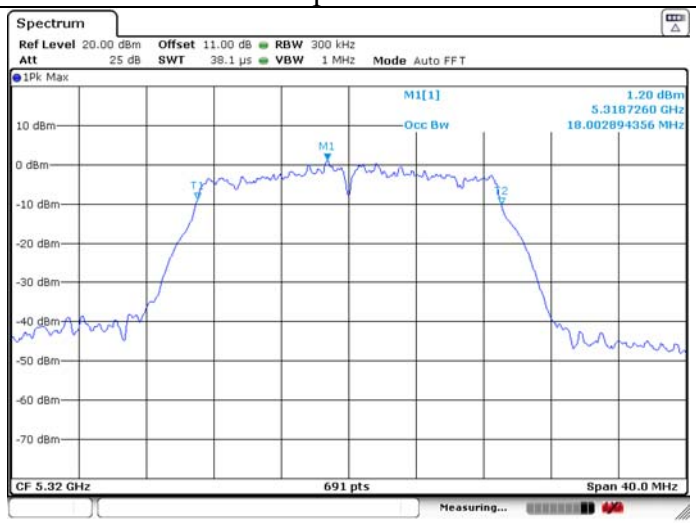


U-NII-2A IEEE 802.11ac VHT20 5320MHz

26dB Bandwidth

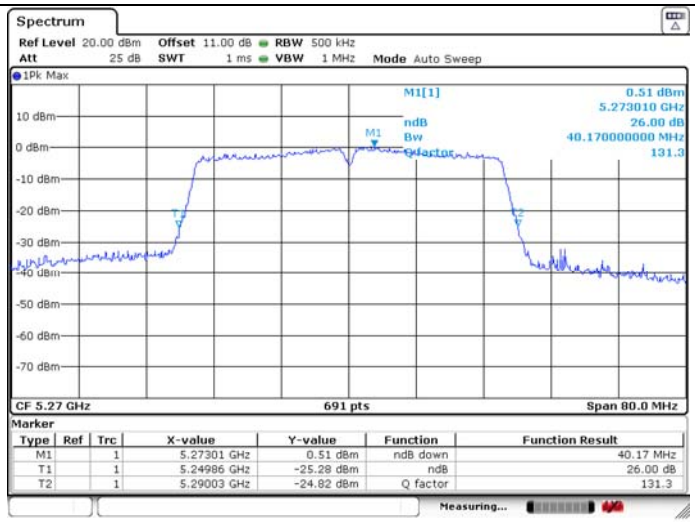


99% Occupied Bandwidth

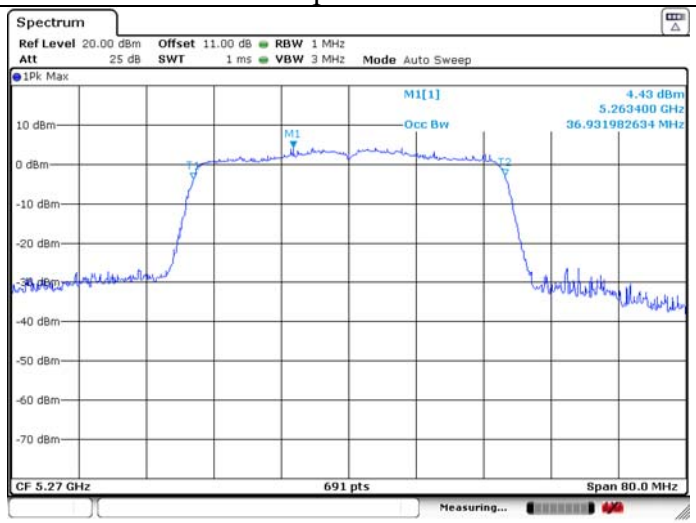


U-NII-2A IEEE 802.11n HT40 5270MHz

26dB Bandwidth

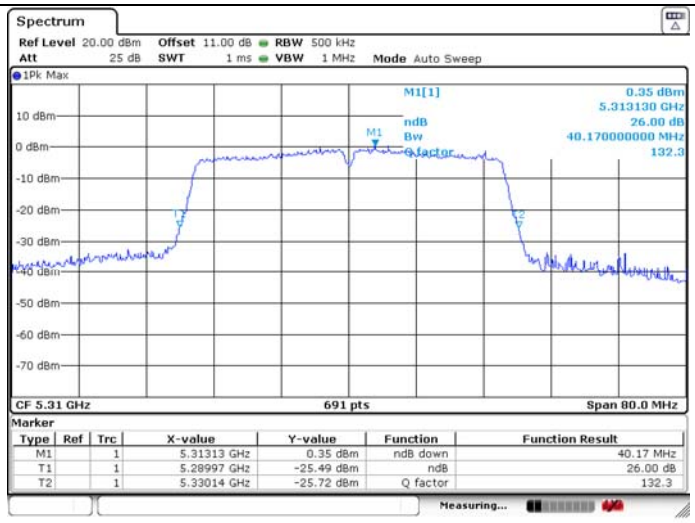


99% Occupied Bandwidth

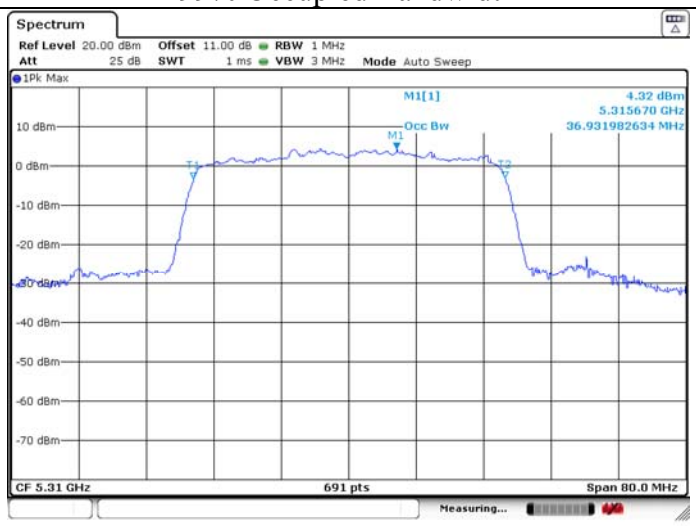


U-NII-2A IEEE 802.11n HT40 5310MHz

26dB Bandwidth

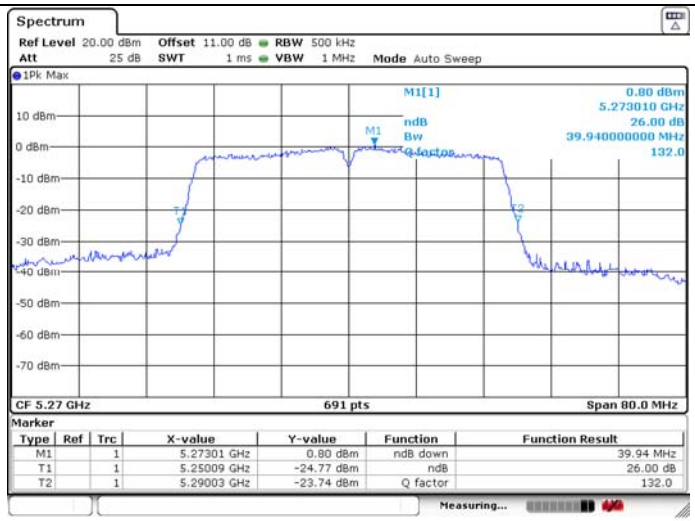


99% Occupied Bandwidth

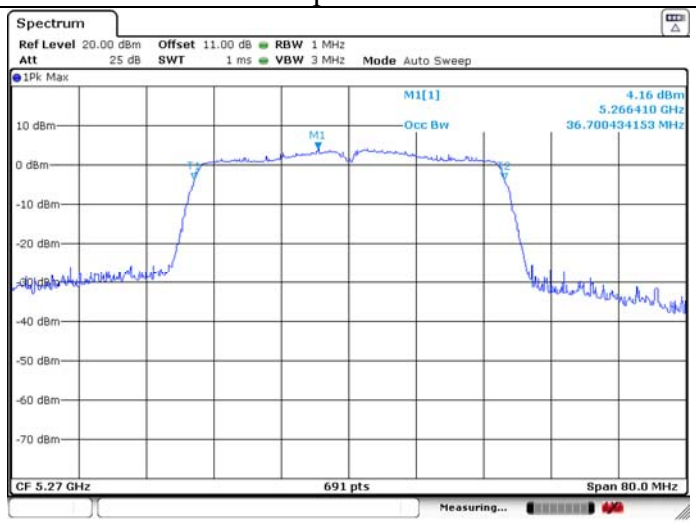


U-NII-2A IEEE 802.11ac VHT40 5270MHz

26dB Bandwidth

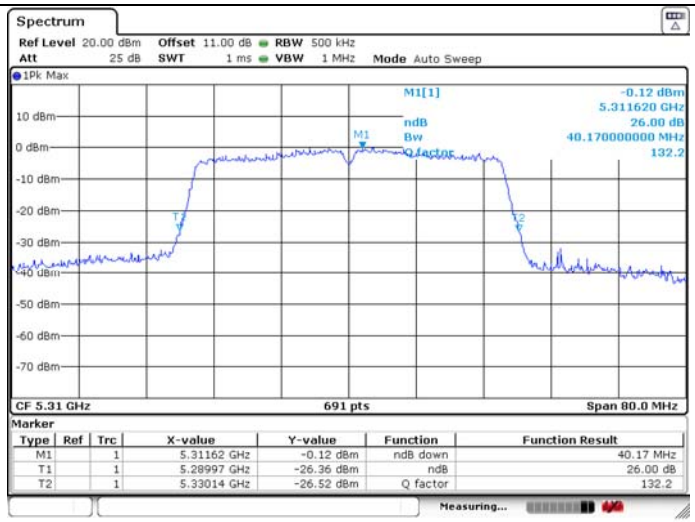


99% Occupied Bandwidth

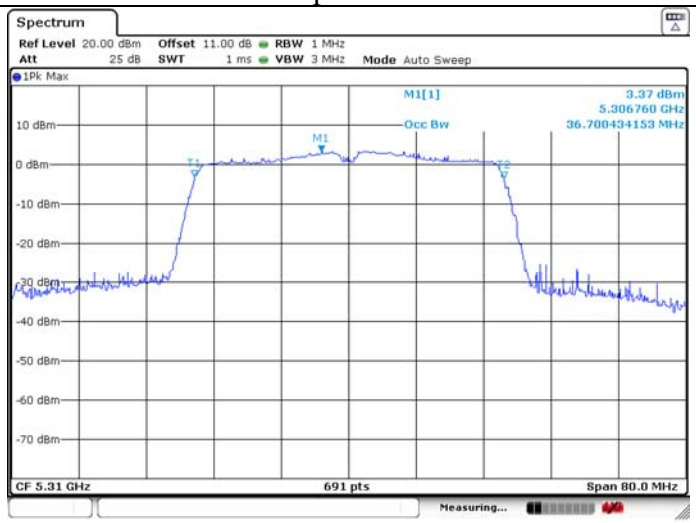


U-NII-2A IEEE 802.11ac VHT40 5310MHz

26dB Bandwidth

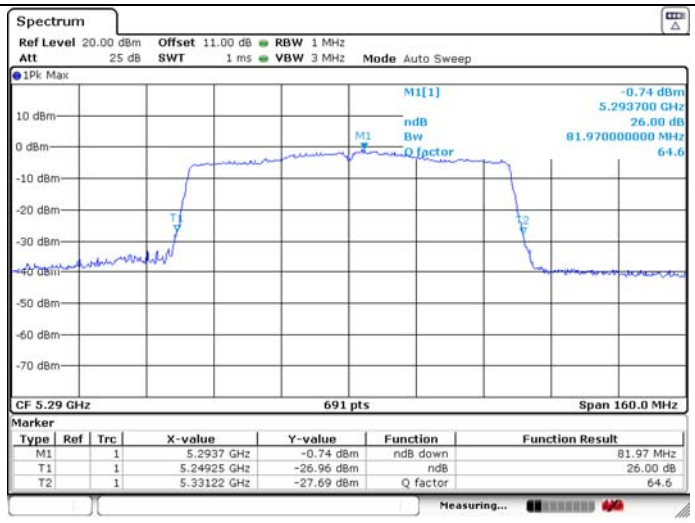


99% Occupied Bandwidth

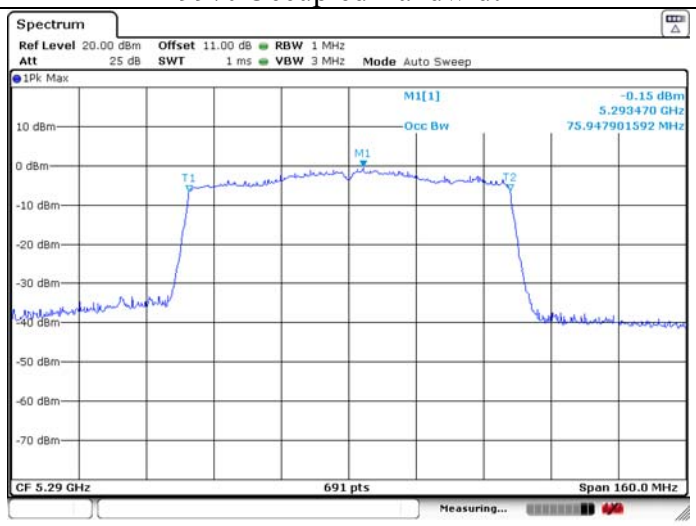


U-NII-2A IEEE 802.11ac VHT80 5290MHz

26dB Bandwidth

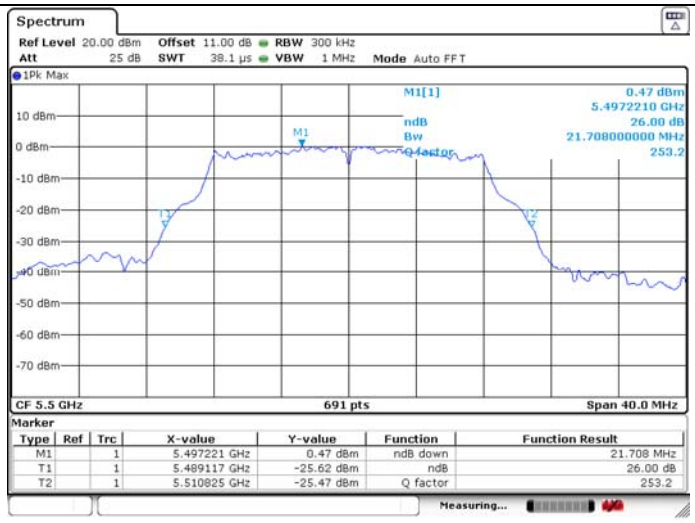


99% Occupied Bandwidth

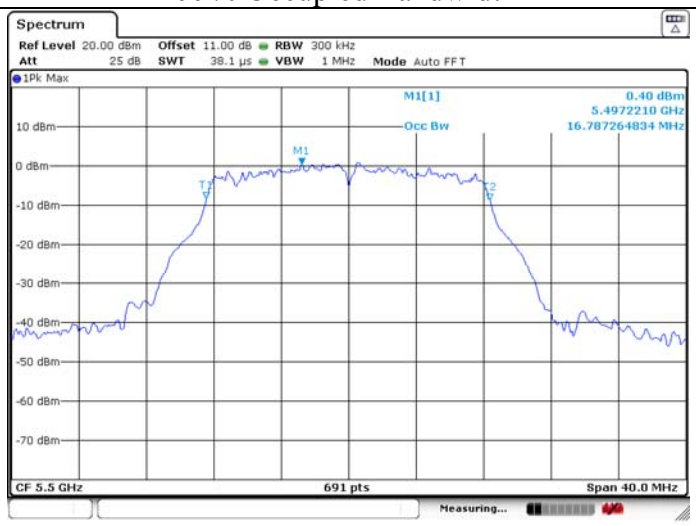


U-NII-2C IEEE 802.11a 5500MHz

26dB Bandwidth

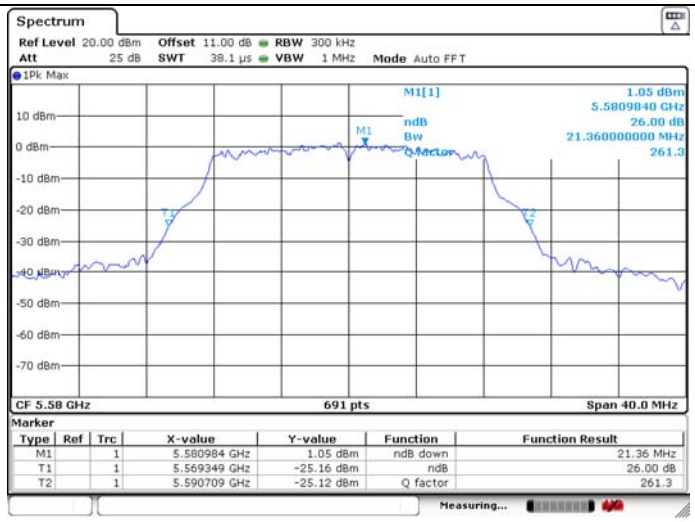


99% Occupied Bandwidth

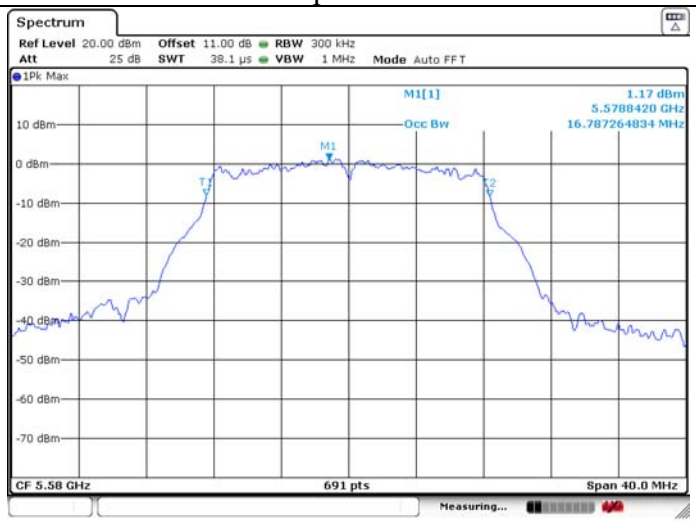


U-NII-2C IEEE 802.11a 5580MHz

26dB Bandwidth

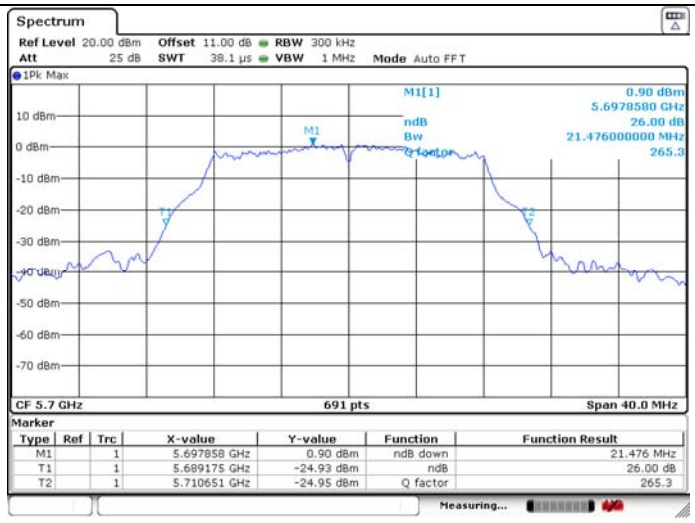


99% Occupied Bandwidth

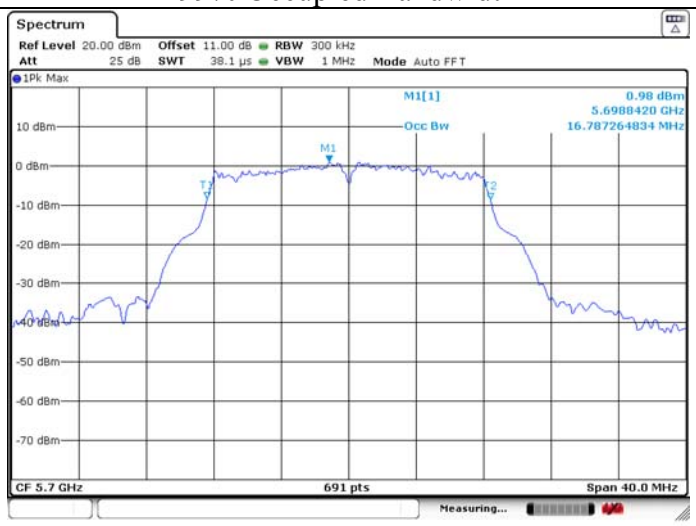


U-NII-2C IEEE 802.11a 5700MHz

26dB Bandwidth

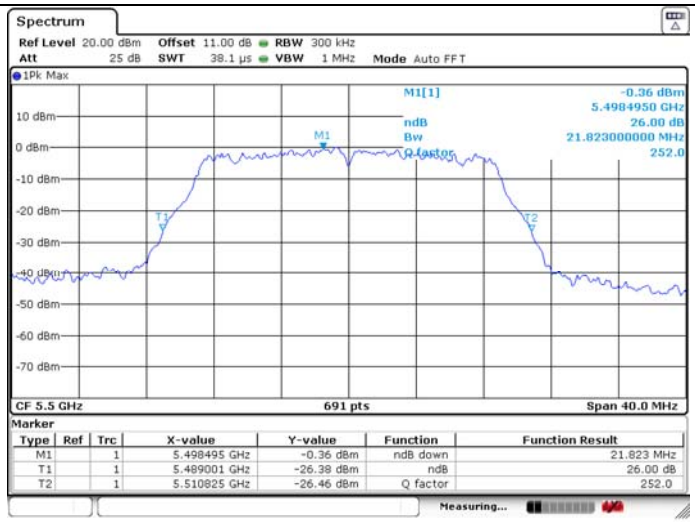


99% Occupied Bandwidth



U-NII-2C IEEE 802.11n HT20 5500MHz

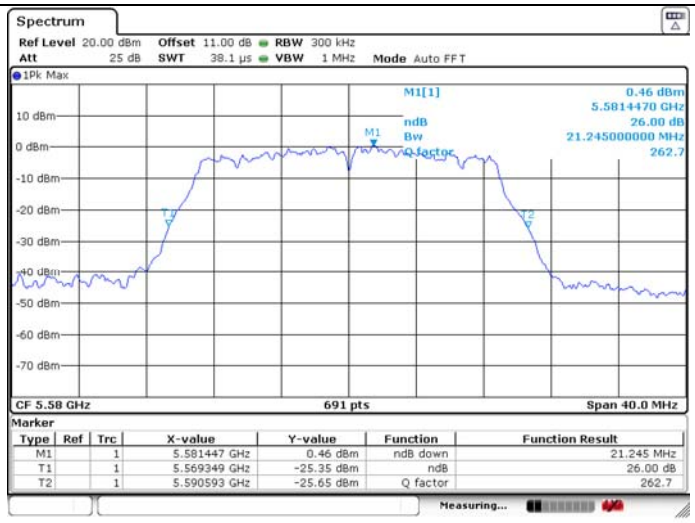
26dB Bandwidth



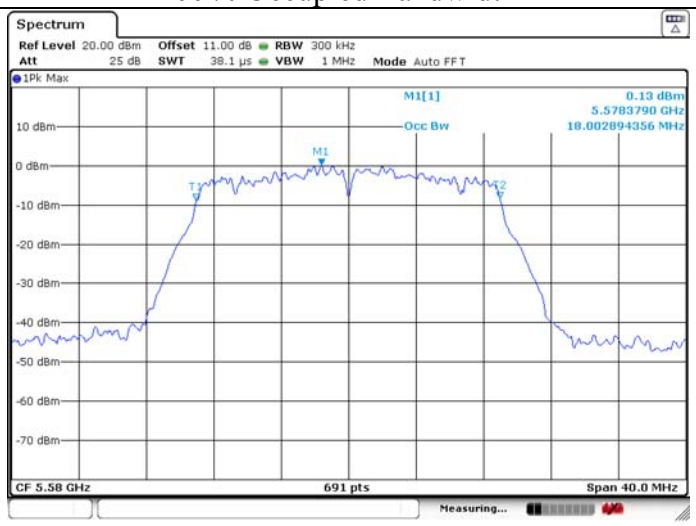
99% Occupied Bandwidth

U-NII-2C IEEE 802.11n HT20 5580MHz

26dB Bandwidth

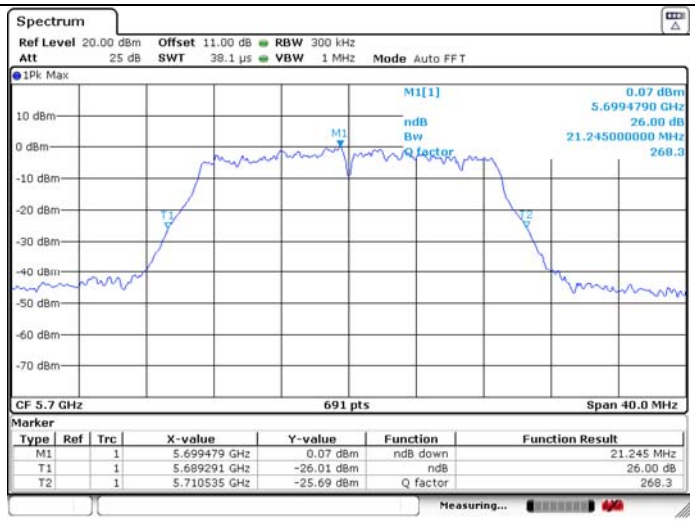


99% Occupied Bandwidth

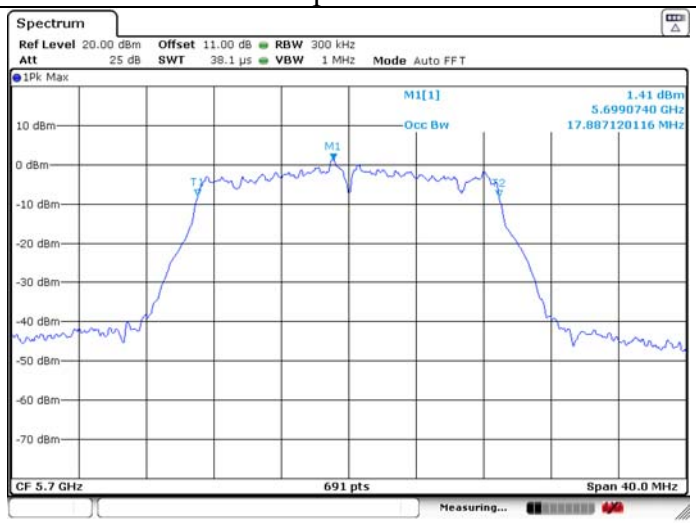


U-NII-2C IEEE 802.11n HT20 5700MHz

26dB Bandwidth

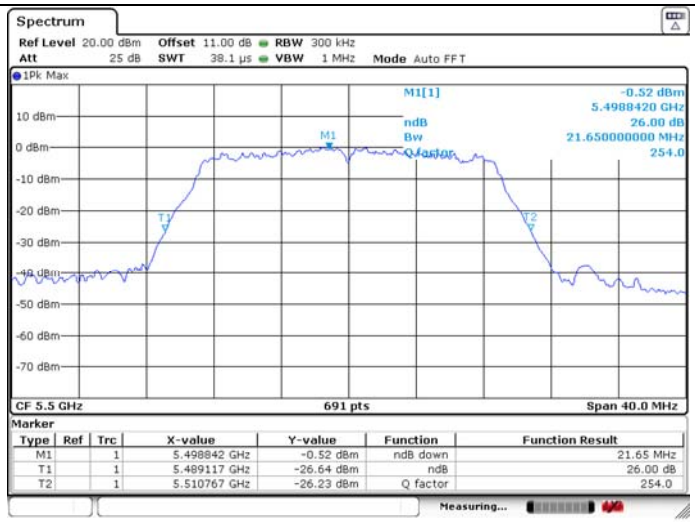


99% Occupied Bandwidth

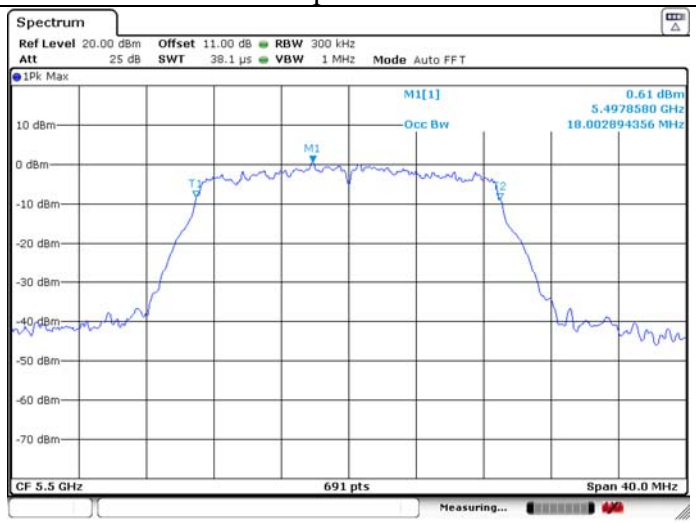


U-NII-2C IEEE 802.11ac VHT20 5500MHz

26dB Bandwidth

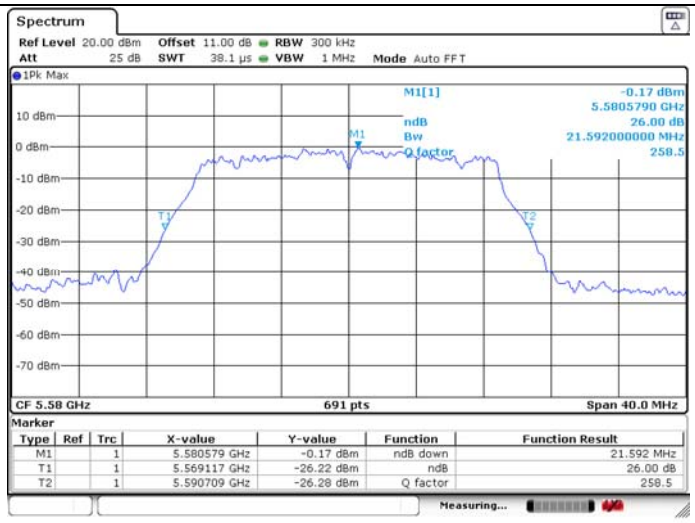


99% Occupied Bandwidth

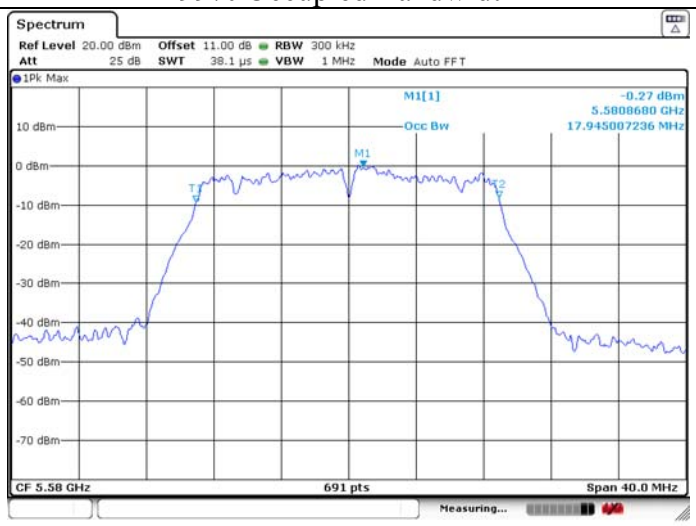


U-NII-2C IEEE 802.11ac VHT20 5580MHz

26dB Bandwidth

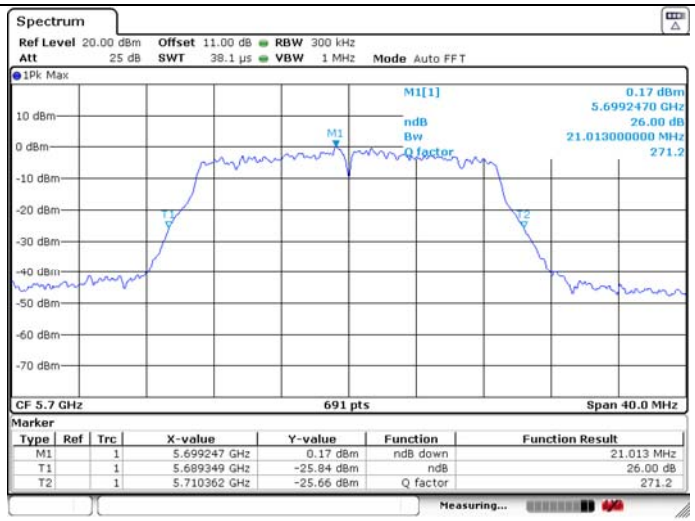


99% Occupied Bandwidth



U-NII-2C IEEE 802.11ac VHT20 5700MHz

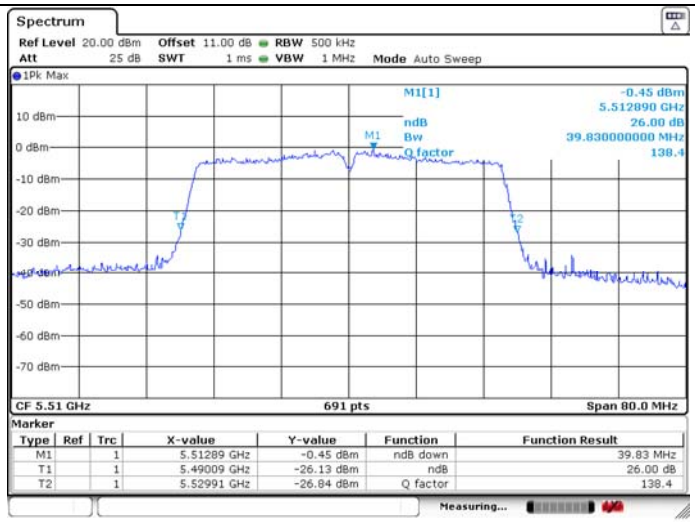
26dB Bandwidth



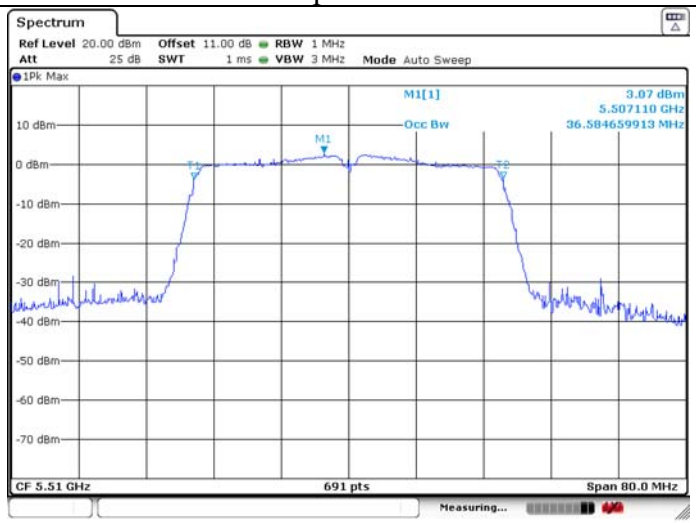
99% Occupied Bandwidth

U-NII-2C IEEE 802.11n HT40 5510MHz

26dB Bandwidth

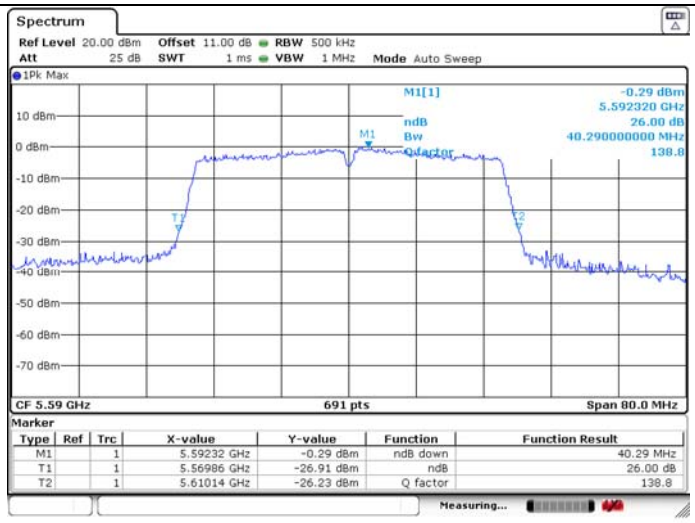


99% Occupied Bandwidth

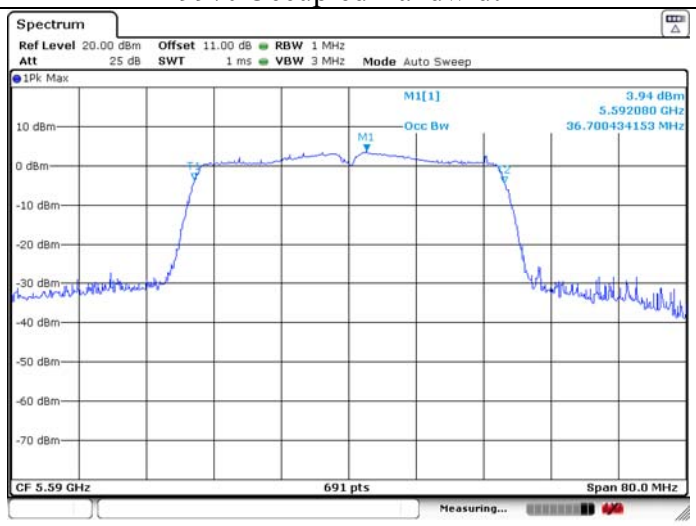


U-NII-2C IEEE 802.11n HT40 5590MHz

26dB Bandwidth

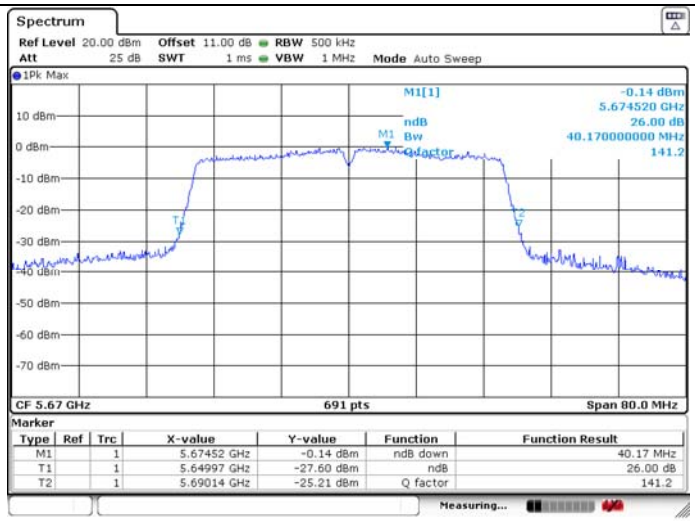


99% Occupied Bandwidth

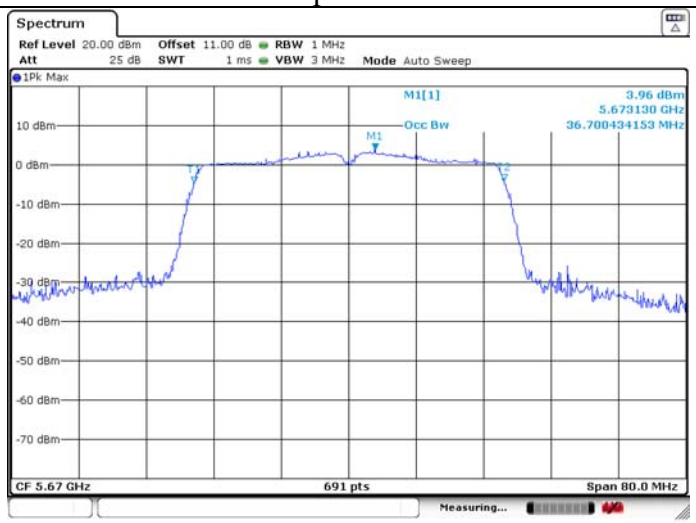


U-NII-2C IEEE 802.11n HT40 5670MHz

26dB Bandwidth

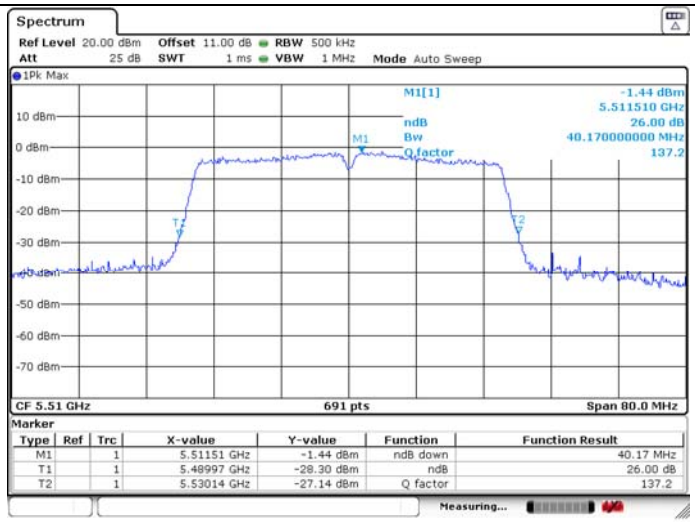


99% Occupied Bandwidth

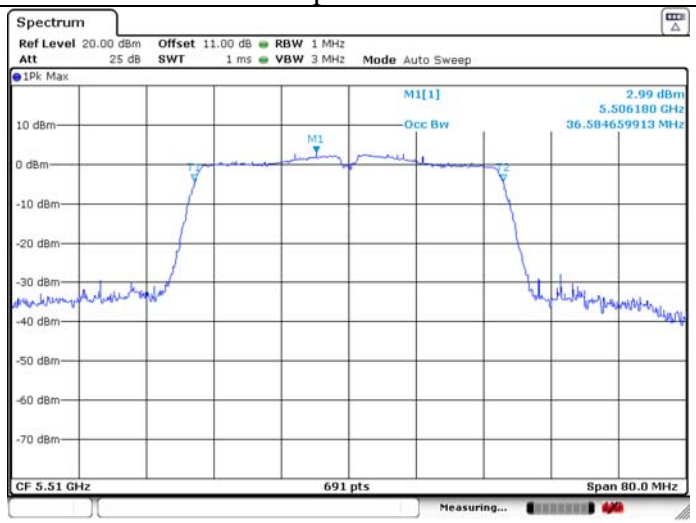


U-NII-2C IEEE 802.11ac VHT40 5510MHz

26dB Bandwidth

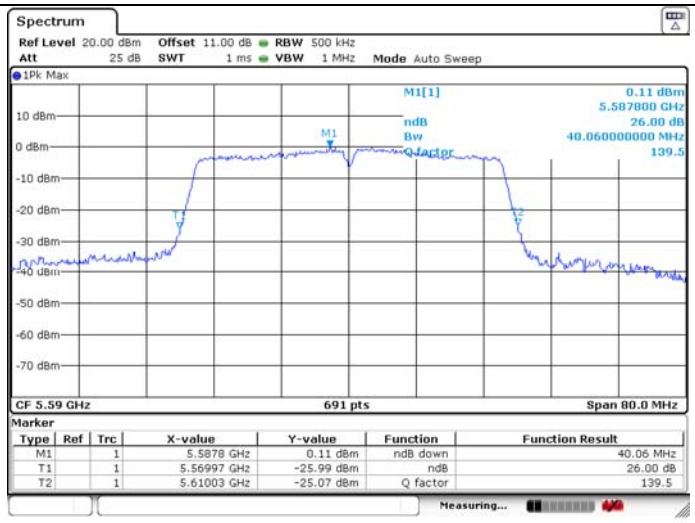


99% Occupied Bandwidth

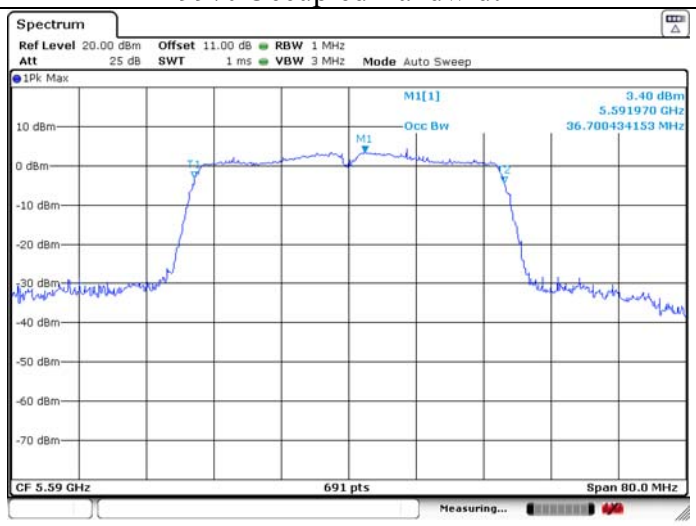


U-NII-2C IEEE 802.11ac VHT40 5590MHz

26dB Bandwidth

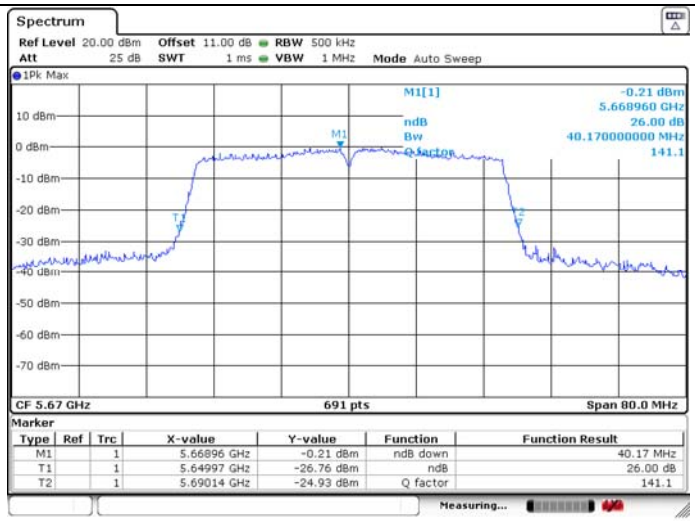


99% Occupied Bandwidth

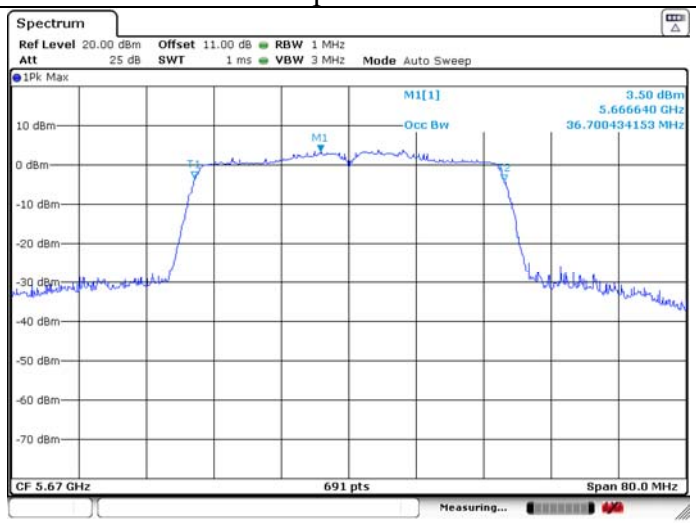


U-NII-2C IEEE 802.11ac VHT40 5670MHz

26dB Bandwidth

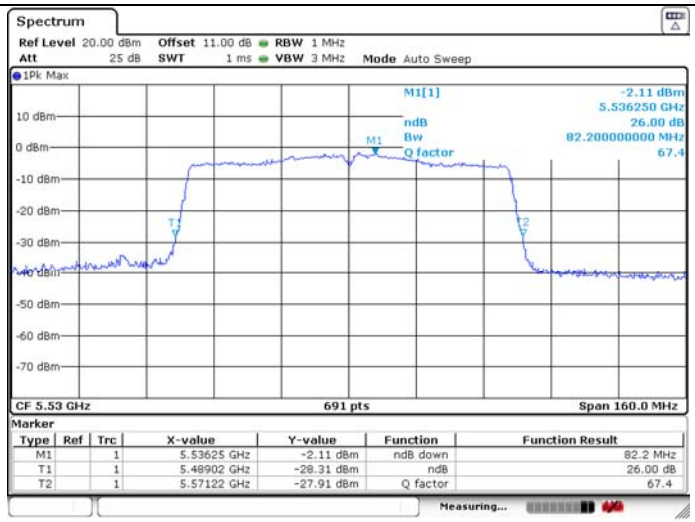


99% Occupied Bandwidth

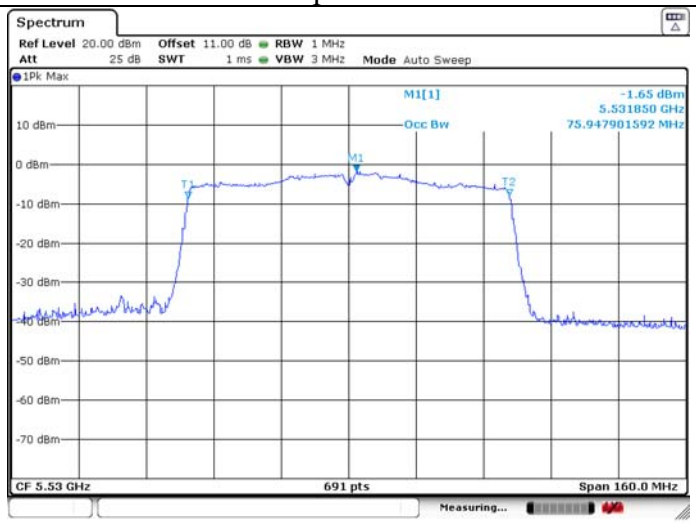


U-NII-2C IEEE 802.11ac VHT80 5530MHz

26dB Bandwidth

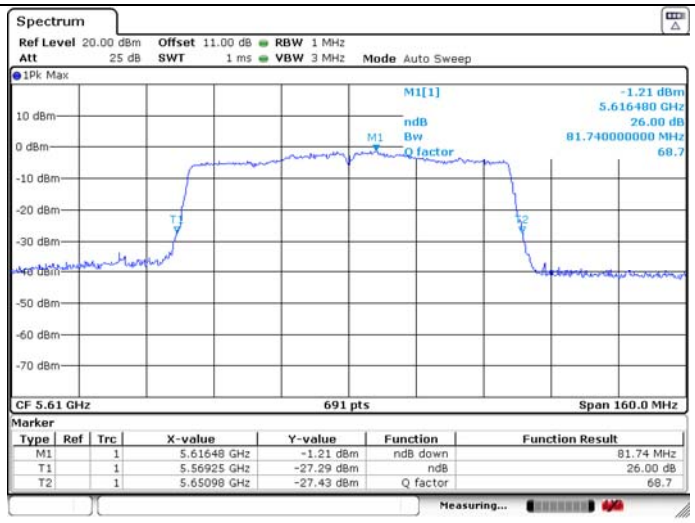


99% Occupied Bandwidth

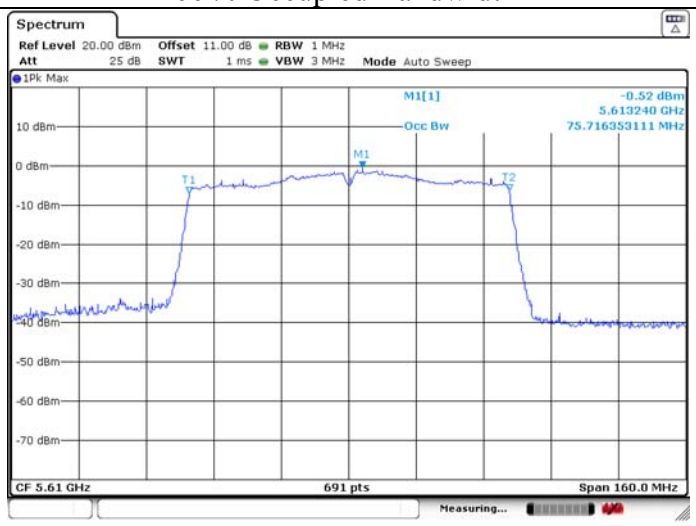


U-NII-2C IEEE 802.11ac VHT80 5610MHz

26dB Bandwidth

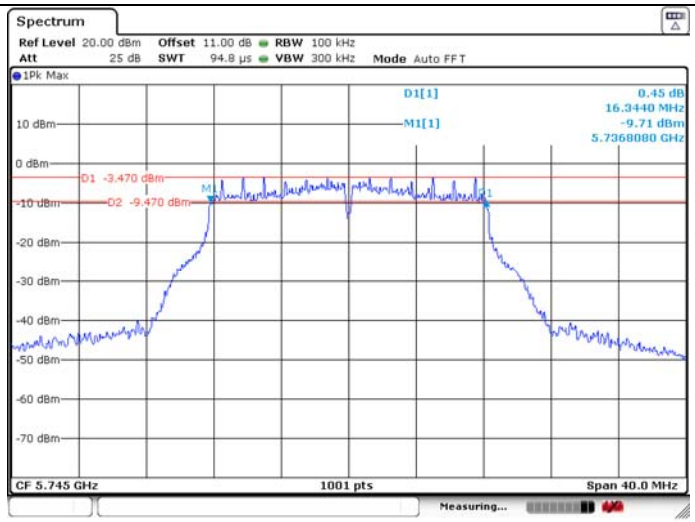


99% Occupied Bandwidth



U-NII-3 IEEE 802.11a 5745MHz

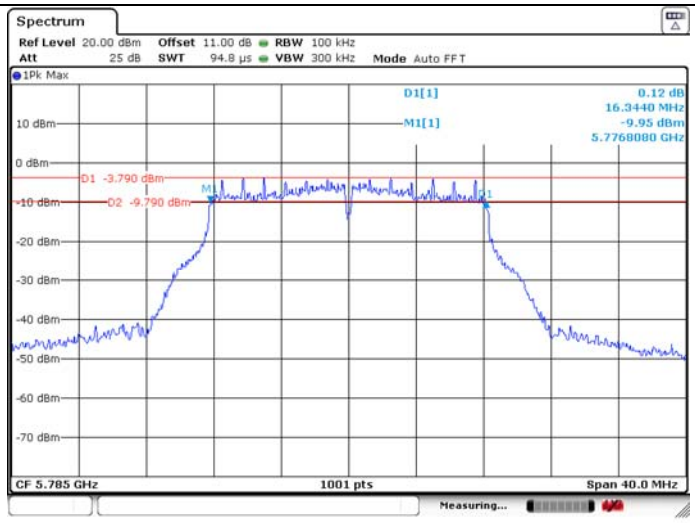
6dB Bandwidth



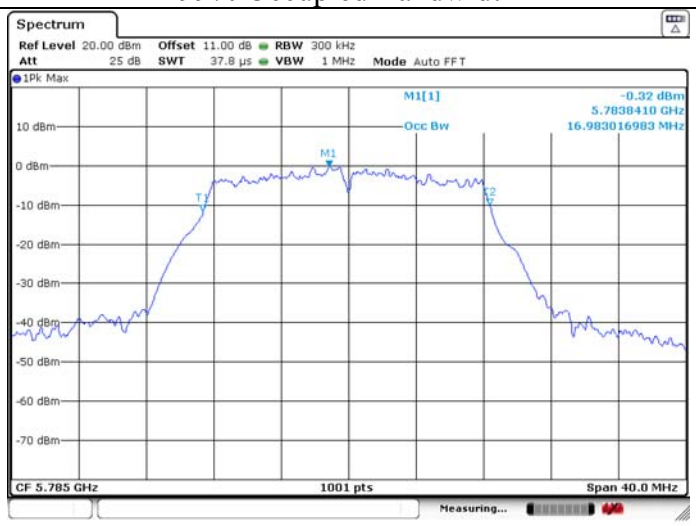
99% Occupied Bandwidth

U-NII-3 IEEE 802.11a 5785MHz

6dB Bandwidth

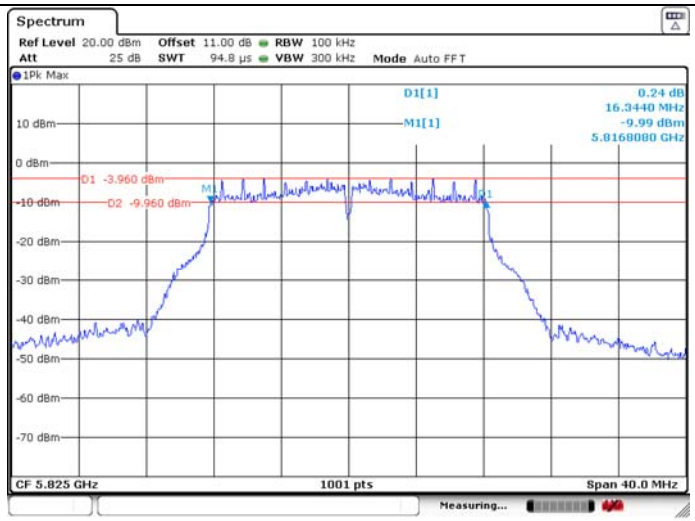


99% Occupied Bandwidth



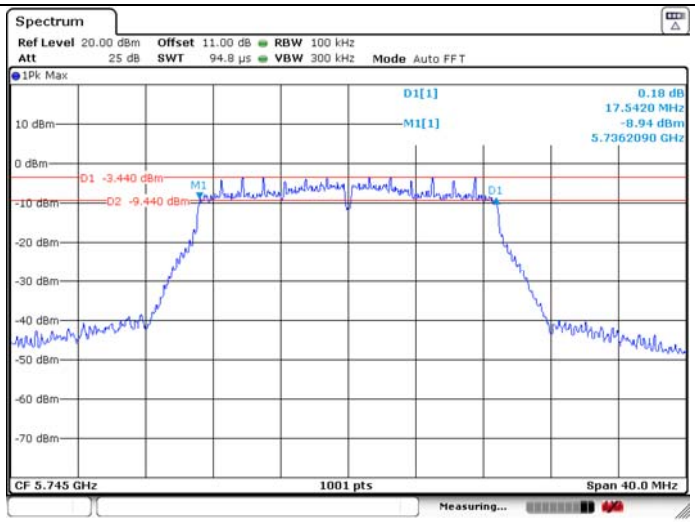
U-NII-3 IEEE 802.11a 5825MHz

6dB Bandwidth

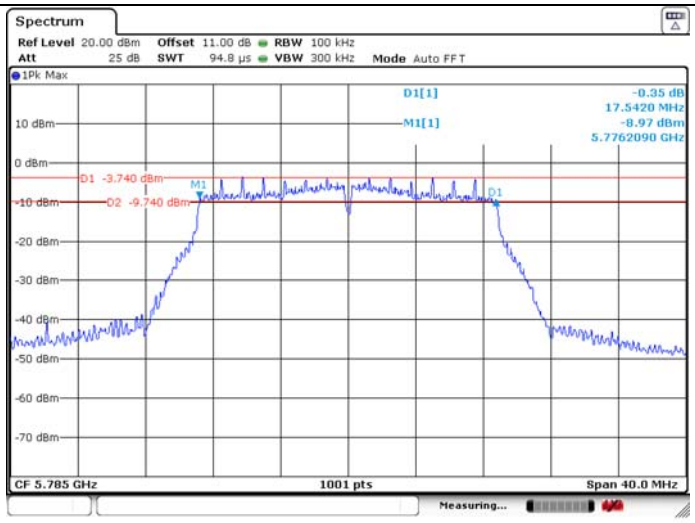
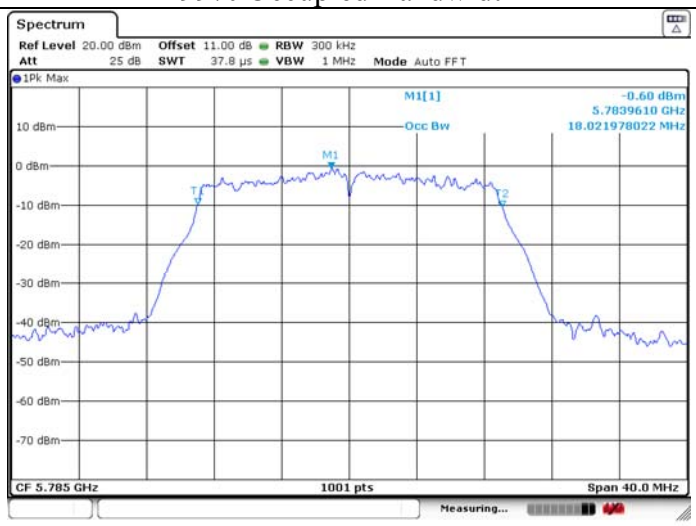


99% Occupied Bandwidth

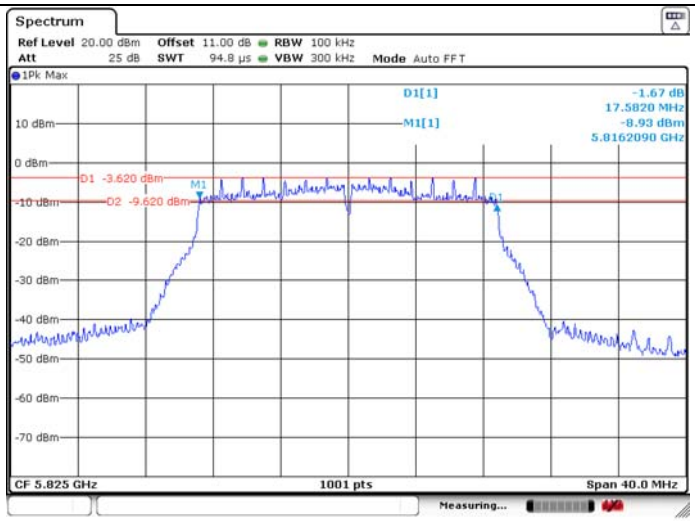
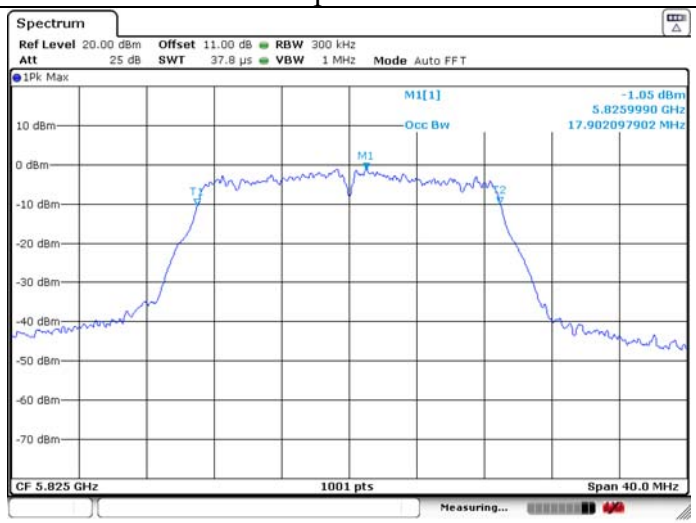
U-NII-3 IEEE 802.11n HT20 5745MHz

6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11n HT20 5785MHz

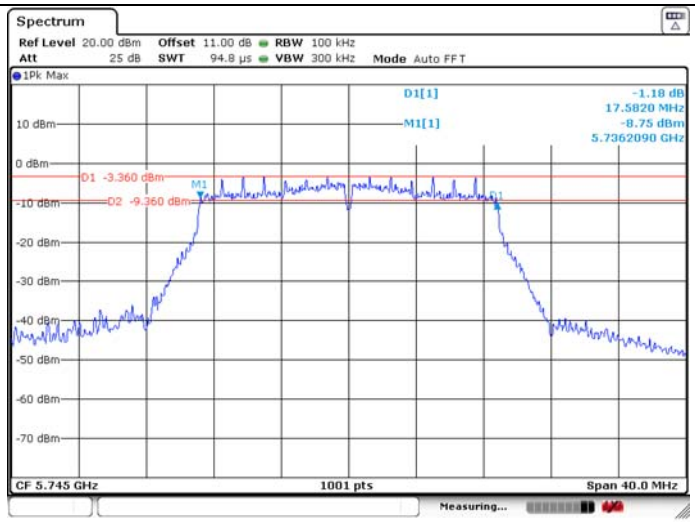
6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11n HT20 5825MHz

6dB Bandwidth	99% Occupied Bandwidth
	

U-NII-3 IEEE 802.11ac VHT20 5745MHz

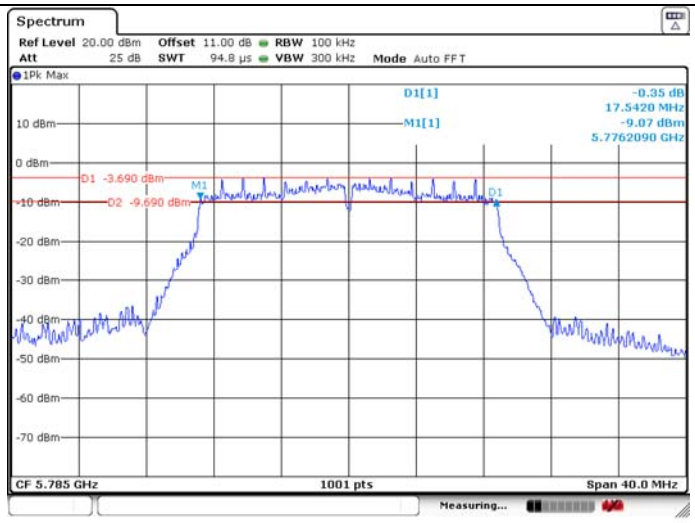
6dB Bandwidth



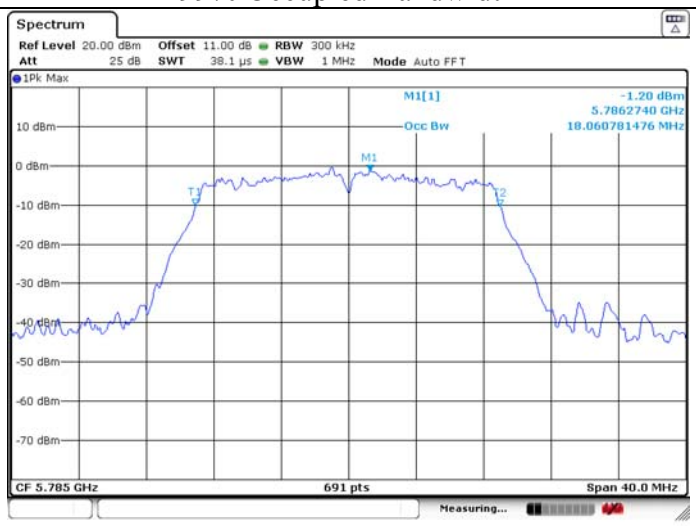
99% Occupied Bandwidth

U-NII-3 IEEE 802.11ac VHT20 5785MHz

6dB Bandwidth

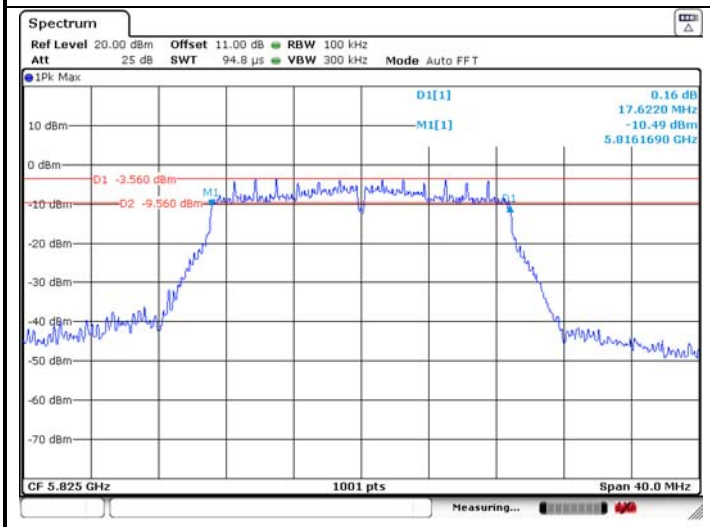


99% Occupied Bandwidth

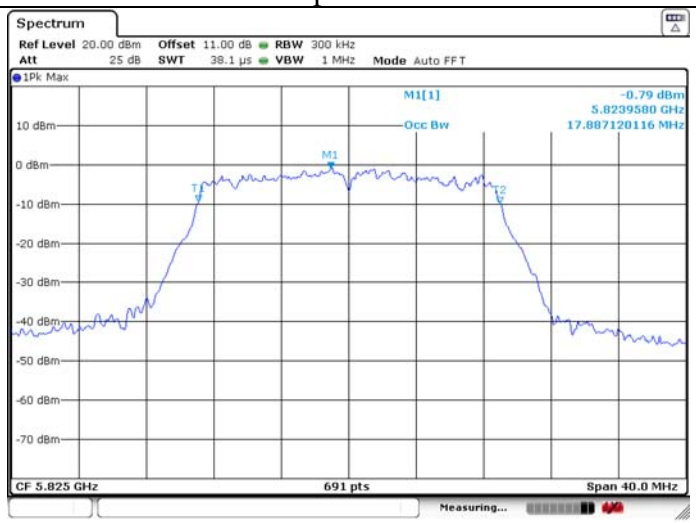


U-NII-3 IEEE 802.11ac VHT20 5825MHz

6dB Bandwidth

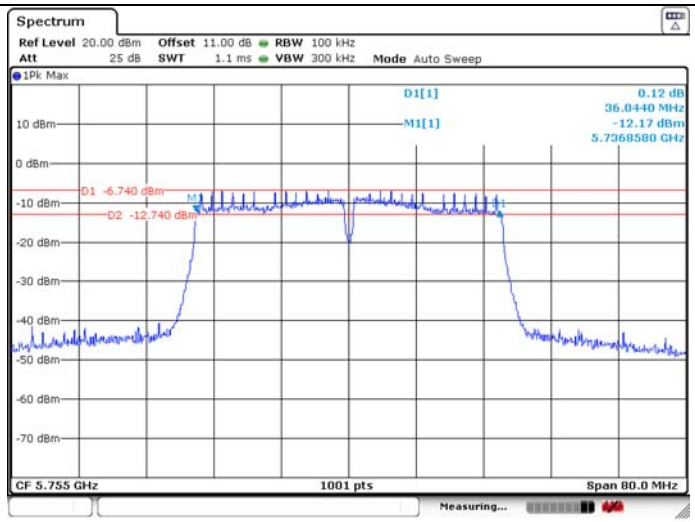


99% Occupied Bandwidth

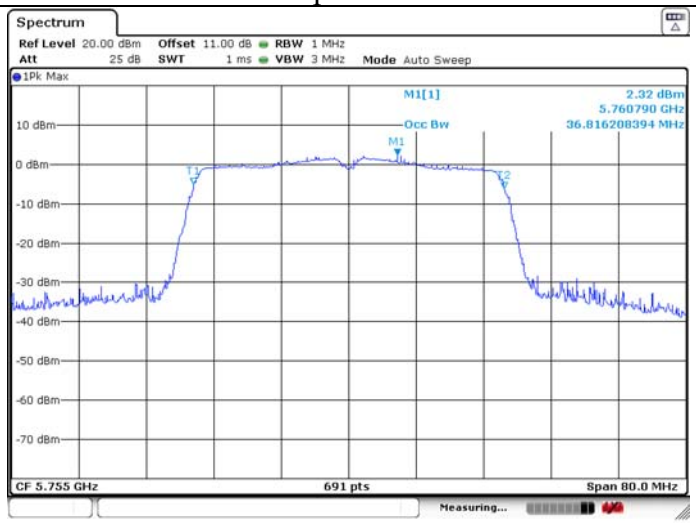


U-NII-3 IEEE 802.11n HT40 5755MHz

6dB Bandwidth

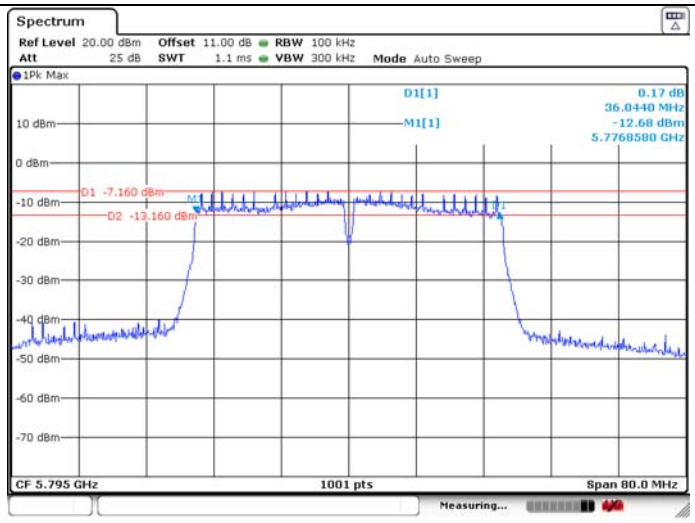


99% Occupied Bandwidth

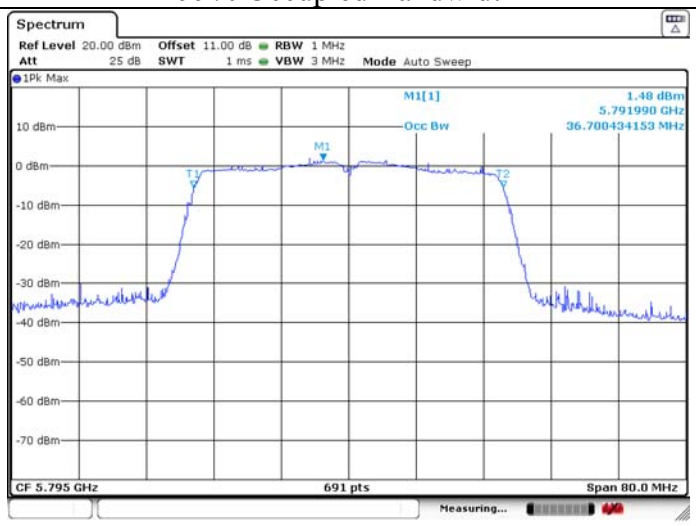


U-NII-3 IEEE 802.11n HT40 5795MHz

6dB Bandwidth

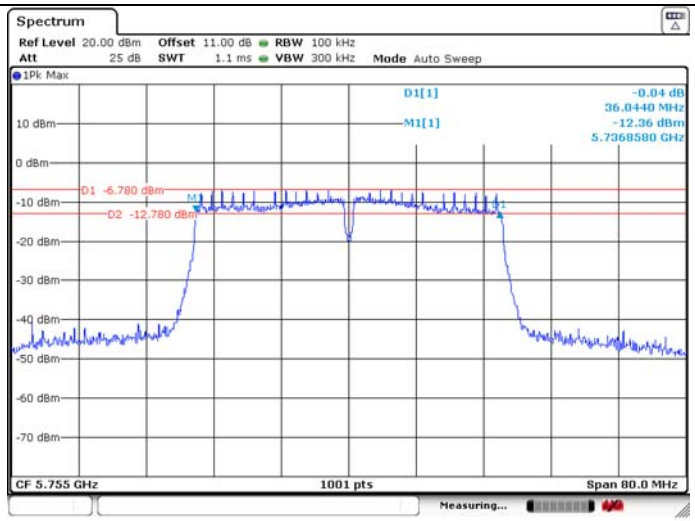


99% Occupied Bandwidth

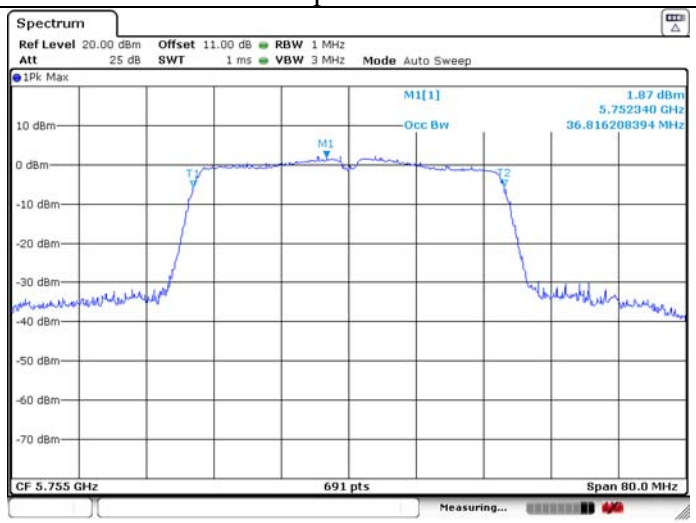


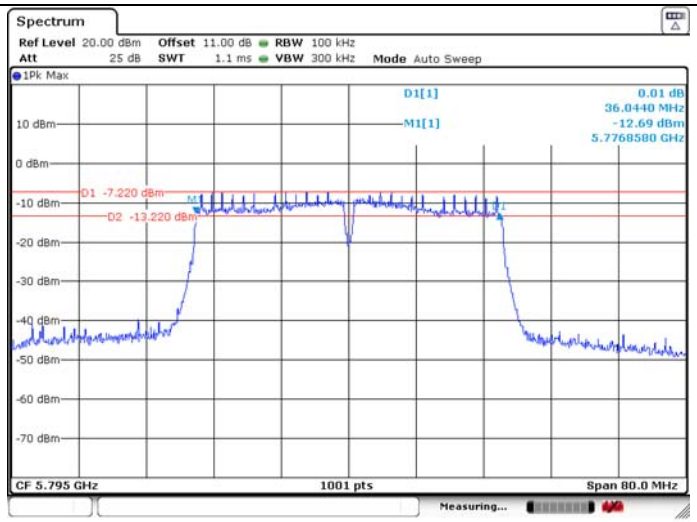
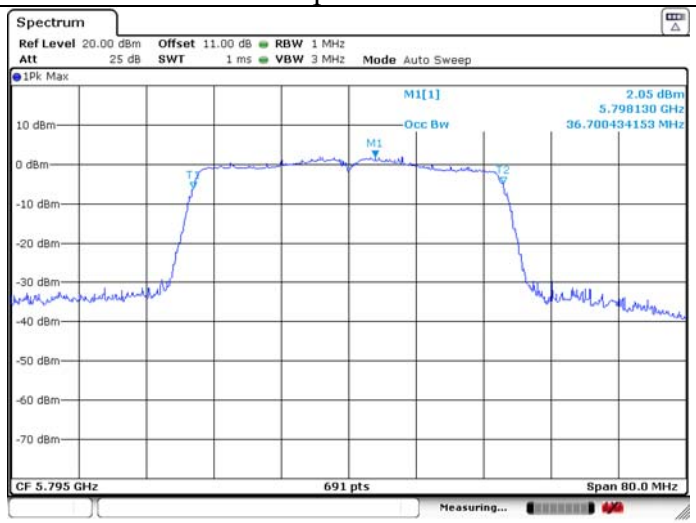
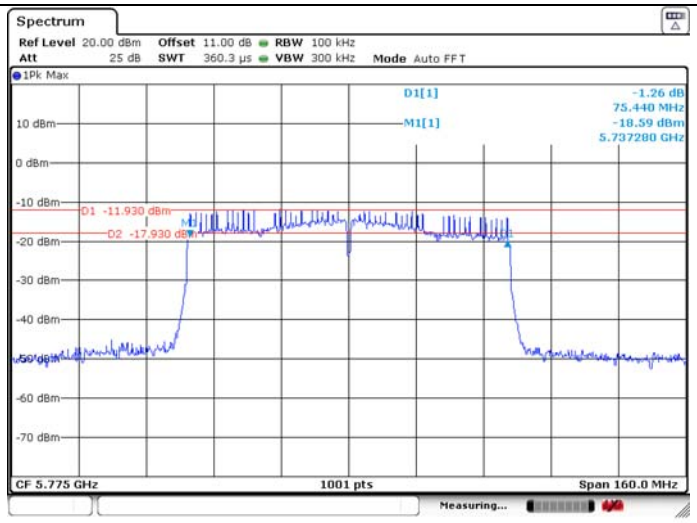
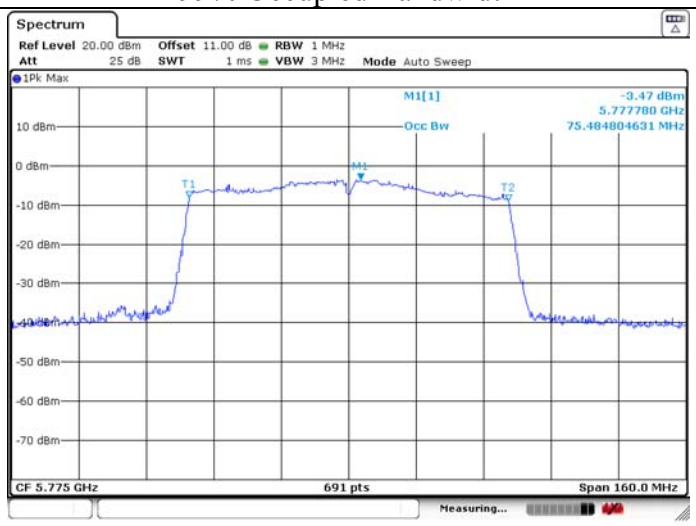
U-NII-3 IEEE 802.11ac VHT40 5755MHz

6dB Bandwidth



99% Occupied Bandwidth



U-NII-3 IEEE 802.11ac VHT40 5795MHz	
6dB Bandwidth	99% Occupied Bandwidth
	
U-NII-3 IEEE 802.11ac VHT80 5775MHz	
6dB Bandwidth	99% Occupied Bandwidth
	

4. MAXIMUM CONDUCTED OUTPUT POWER

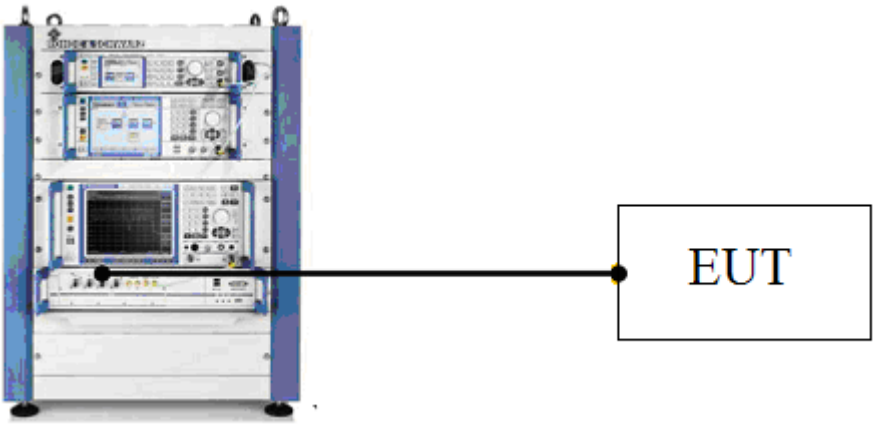
4.1. Limit

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	25℃	Relative Humidity			51%	Test Voltage	AC 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	14.362	14.758			23.98	PASS
		5200	14.499	15.001			23.98	PASS
		5240	14.715	15.192			23.98	PASS
	IEEE 802.11n HT20	5180	12.035	12.353	0.03317	15.21	23.98	PASS
		5200	10.347	10.801	0.02286	13.59	23.98	PASS
		5240	10.478	10.893	0.02345	13.70	23.98	PASS
	IEEE 802.11ac VHT20	5180	12.023	12.282	0.03285	15.16	23.98	PASS
		5200	12.190	12.629	0.03488	15.43	23.98	PASS
		5240	12.326	12.732	0.03584	15.54	23.98	PASS
	IEEE 802.11n HT40	5190	13.866	14.220	0.05078	17.06	23.98	PASS
		5230	14.105	14.310	0.05271	17.22	23.98	PASS
	IEEE 802.11ac VHT40	5190	13.778	14.246	0.05045	17.03	23.98	PASS
		5230	14.087	14.306	0.05258	17.21	23.98	PASS
	IEEE 802.11ac VHT80	5210	12.494	11.956	0.03345	15.24	23.98	PASS
U-NII-2A	IEEE 802.11a	5260	14.735	15.257			23.98	PASS
		5300	14.491	15.093			23.98	PASS
		5320	14.264	14.873			23.98	PASS
	IEEE 802.11n HT20	5260	14.622	14.851	0.05954	17.75	23.98	PASS
		5300	14.294	14.650	0.05605	17.49	23.98	PASS
		5320	14.004	14.470	0.05313	17.25	23.98	PASS
	IEEE 802.11ac VHT20	5260	14.437	14.833	0.05821	17.65	23.98	PASS
		5300	10.596	14.677	0.04083	16.11	23.98	PASS
		5320	13.963	14.426	0.05261	17.21	23.98	PASS
	IEEE 802.11n HT40	5270	13.782	14.429	0.05162	17.13	23.98	PASS
		5310	13.663	14.247	0.04983	16.98	23.98	PASS
	IEEE 802.11ac VHT40	5270	13.860	14.440	0.05212	17.17	23.98	PASS
		5310	13.604	14.213	0.04931	16.93	23.98	PASS
	IEEE 802.11ac VHT80	5290	11.546	12.211	0.03091	14.90	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-2C	IEEE 802.11a	5290	11.546	12.211			23.98	PASS
		5500	12.893	13.637			23.98	PASS
		5580	13.357	14.284			23.98	PASS
	IEEE 802.11n HT20	5700	13.449	14.335	0.02713	14.34	23.98	PASS
		5500	12.813	13.403	0.04100	16.13	23.98	PASS
		5580	13.298	14.101	0.04708	16.73	23.98	PASS
	IEEE 802.11ac VHT20	5700	13.349	14.105	0.04736	16.75	23.98	PASS
		5500	12.753	13.362	0.04054	16.08	23.98	PASS
		5580	13.085	14.038	0.04569	16.60	23.98	PASS
	IEEE 802.11n HT40	5700	13.391	14.073	0.04738	16.76	23.98	PASS
		5510	12.171	12.890	0.03594	15.56	23.98	PASS
		5590	12.506	13.325	0.03931	15.95	23.98	PASS
	IEEE 802.11ac VHT40	5670	12.925	13.814	0.04368	16.40	23.98	PASS
		5510	12.093	12.915	0.03576	15.53	23.98	PASS
		5590	12.650	13.329	0.03993	16.01	23.98	PASS
	IEEE 802.11ac VHT80	5670	12.704	13.529	0.04118	16.15	23.98	
		5530	10.340	11.185	0.02395	13.79	23.98	PASS
U-NII-3	IEEE 802.11a	5745	13.433	14.077			30.00	PASS
		5785	13.159	13.598			30.00	PASS
		5825	12.958	13.413			30.00	PASS
	IEEE 802.11n HT20	5745	13.263	13.877	0.04562	16.59	30.00	PASS
		5785	13.054	11.492	0.03430	15.35	30.00	PASS
		5825	12.795	11.170	0.03212	15.07	30.00	PASS
	IEEE 802.11ac VHT20	5745	13.353	13.826	0.04577	16.61	30.00	PASS
		5785	12.884	13.212	0.04038	16.06	30.00	PASS
		5825	12.791	13.118	0.03952	15.97	30.00	PASS
	IEEE 802.11n HT40	5755	12.945	13.457	0.04187	16.22	30.00	PASS
		5795	12.718	13.005	0.03867	15.87	30.00	PASS
	IEEE 802.11ac VHT40	5755	12.893	13.257	0.04064	16.09	30.00	PASS
		5795	12.662	13.010	0.03846	15.85	30.00	PASS
	IEEE 802.11ac VHT80	5775	11.944	11.477	0.02970	14.73	30.00	PASS