

FCC PART 15E TEST REPORT FOR CERTIFICATION

On Behalf of

Touchjet, Inc.

WAVE+Lily

Model Number: TW6

FCC ID: 2AJZVTW6

Prepared for:	Touchjet, Inc.
	1563 Solano Ave. #472, Berkeley, California 94707, United States
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
	Tel: 86-769-83081888-808

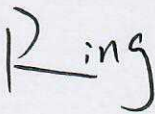
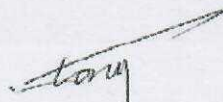
Report Number:	ESTE-R1907105
Date of Test:	May. 10~Jun. 13, 2019
Date of Report:	Jul. 29, 2019

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EST Technology Co., Ltd.

Applicant:	Touchjet, Inc.		
Address:	1563 Solano Ave. #472, Berkeley, California 94707, United States		
Manufacturer:	Touchjet, Inc.		
Address:	1563 Solano Ave. #472, Berkeley, California 94707, United States		
E.U.T:	WAVE+Lily		
Model Number:	TW6		
Power Supply:	DC 12V From Adapter Input AC 100-240V, 50/60Hz		
Trade Name:	Touchjet WAVE	Serial No.:	-----
Date of Receipt:	May. 10, 2019	Date of Test:	May. 10~Jun. 13, 2019
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.		
Prepared by:	Reviewed by:	Date: Jul. 29, 2019 Approved by:	
 Ring / Assistant	 Tony / 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	:	2AJZVTW6
Product Name	:	WAVE+Lily
Model Number	:	TW6
Software Version	:	1.1
Hardware Version	:	1.1
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: 12.149dBm IEEE 802.11n HT20: 14.611dBm IEEE 802.11n HT40: 14.239dBm IEEE 802.11ac VHT20: 14.902dBm IEEE 802.11ac VHT40: 14.450dBm IEEE 802.11ac VHT80: 13.703dBm
		U-NII-2A	IEEE 802.11a: 12.133dBm IEEE 802.11n HT20: 15.078dBm IEEE 802.11n HT40: 15.675dBm IEEE 802.11ac VHT20: 14.864dBm IEEE 802.11ac VHT40: 15.592dBm IEEE 802.11ac VHT80: 14.762dBm
		U-NII-2C	IEEE 802.11a: 11.635dBm IEEE 802.11n HT20: 14.078dBm IEEE 802.11n HT40: 14.804dBm IEEE 802.11ac VHT20: 14.020dBm IEEE 802.11ac VHT40: 14.834dBm IEEE 802.11ac VHT80: 13.833dBm
		U-NII-3	IEEE 802.11a: 11.689dBm IEEE 802.11n HT20: 14.473dBm IEEE 802.11n HT40: 14.189dBm IEEE 802.11ac VHT20: 14.000dBm IEEE 802.11ac VHT40: 14.323dBm IEEE 802.11ac VHT80: 13.884dBm
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	Internal	N/A	2.5
2	N/A	N/A	Internal	N/A	2.5

Remark:

- (1) The EUT can work as CDD mode in 802.11n and 802.11ac, and can operate with one spatial stream.

According to KDB 662911 F 2) f) (i):

$$\text{Directional gain} = 2.5\text{dBi} + 10 \times \log(2/1)\text{dB} = 5.51\text{dBi} < 6\text{dBi}$$

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.

TX Mode \ ANT No.	SISO Configuration	MIMO Configuration
802.11a	ANT 1	/
802.11n HT20	/	ANT1+ANT2
802.11n HT40	/	ANT1+ANT2
802.11ac VHT20	/	ANT1+ANT2
802.11ac VHT40	/	ANT1+ANT2
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	$\pm 0.6^{\circ}\text{C}$
Humidity	$\pm 4.0\%$
Volatage DC	$\pm 1.0\%$
Volatage (AC, <10KHz)	$\pm 1.5\%$

Note:

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

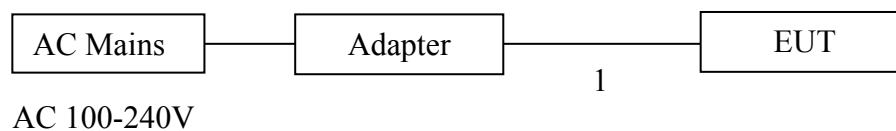
2.4. Assistant equipment used for test

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

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.5m	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.



(EUT: WAVE+Lily)

2.6. Test Mode

Pre-scan has been combined all possible modulations and data 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	RFTestTool		
U-NII-1			
Frequency(MHz)	5180	5200	5240
IEEE 802.11a Setting	N/A	N/A	N/A
IEEE 802.11n HT20 Setting	N/A	N/A	N/A
IEEE 802.11ac VHT20 Setting	N/A	N/A	N/A
Frequency(MHz)	5190	5230	
IEEE 802.11n HT40 Setting	N/A	N/A	
IEEE 802.11ac VHT40 Setting	N/A	N/A	
Frequency(MHz)	5210		
IEEE 802.11ac VHT80 Setting	N/A		
U-NII-2A			
Frequency(MHz)	5260	5300	5320
IEEE 802.11a Setting	N/A	N/A	N/A
IEEE 802.11n HT20 Setting	N/A	N/A	N/A
IEEE 802.11ac VHT20 Setting	N/A	N/A	N/A
Frequency(MHz)	5270	5310	
IEEE 802.11n HT40 Setting	N/A	N/A	
IEEE 802.11ac VHT40 Setting	N/A	N/A	
Frequency(MHz)	5290		
IEEE 802.11ac VHT80 Setting	N/A		
U-NII-2C			
Frequency(MHz)	5500	5580	5700
IEEE 802.11a Setting	N/A	N/A	N/A
IEEE 802.11n HT20 Setting	N/A	N/A	N/A
IEEE 802.11ac VHT20 Setting	N/A	N/A	N/A
Frequency(MHz)	5510	5670	
IEEE 802.11n HT40 Setting	N/A	N/A	
IEEE 802.11ac VHT40 Setting	N/A	N/A	
Frequency(MHz)	5530	5610	
IEEE 802.11ac VHT80 Setting	N/A	N/A	
U-NII-3			
Frequency(MHz)	5745	5785	5825
IEEE 802.11a Setting	N/A	N/A	N/A
IEEE 802.11n HT20 Setting	N/A	N/A	N/A
IEEE 802.11ac VHT20 Setting	N/A	N/A	N/A
Frequency(MHz)	5755	5795	
IEEE 802.11n HT40 Setting	N/A	N/A	
IEEE 802.11ac VHT40 Setting	N/A	N/A	
Frequency(MHz)	5775		
IEEE 802.11ac VHT80 Setting	N/A		

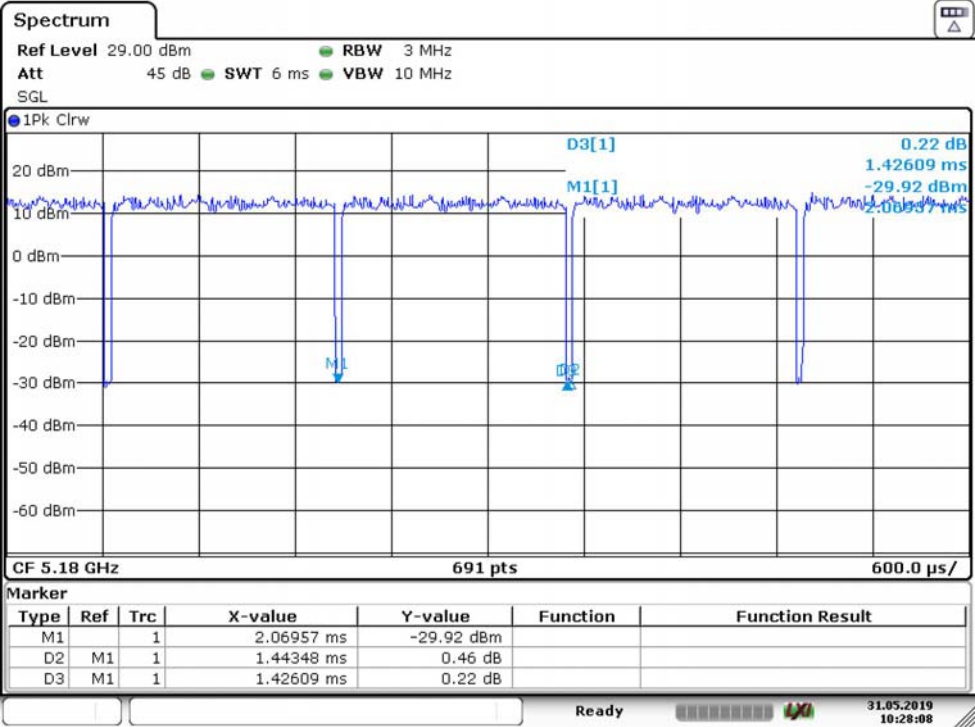
2.9. Duty Cycle of Test Signal

Temperature	25℃	Relative Humidity		55%	Test Voltage		120V/60Hz
Mode	Frequency (MHz)	On time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T (Hz)	VBW Setting (dB)
802.11a	5180	1.42609	1.44348	98.80	0.00	10	10
802.11n HT20	5180	1.33043	1.34783	98.71	0.00	10	10
802.11n HT40	5190	0.67826	0.68696	98.73	0.00	10	10
802.11ac VHT20	5180	1.33913	1.35652	98.72	0.00	10	10
802.11ac VHT40	5190	0.67826	0.69565	97.50	0.11	1474	1474
802.11ac VHT80	5210	0.34783	0.36522	95.24	0.21	2875	2875

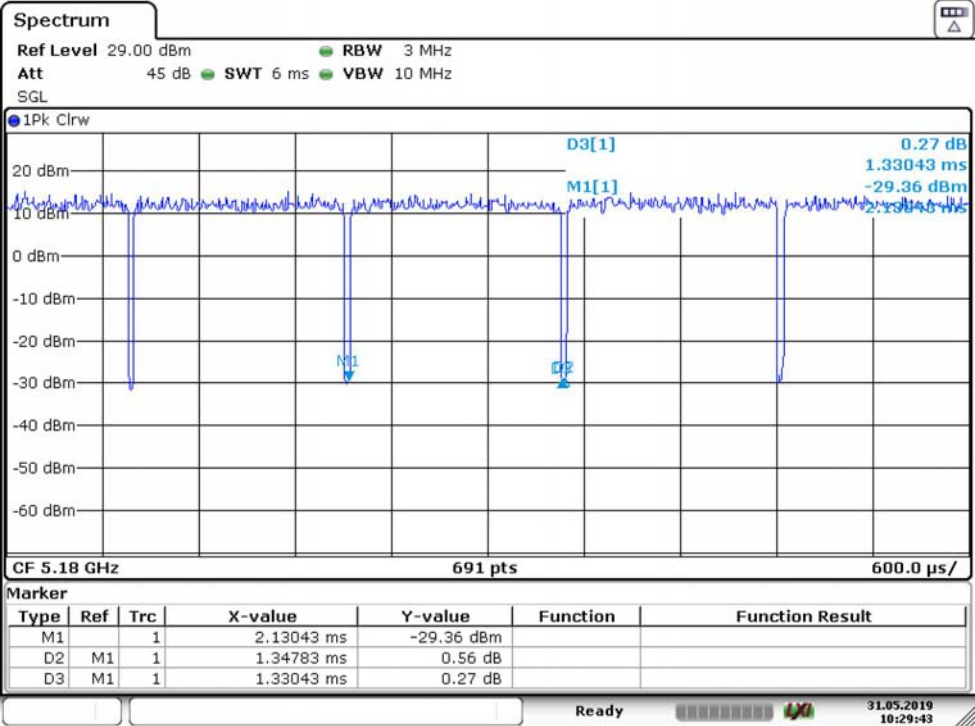
Note:

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.

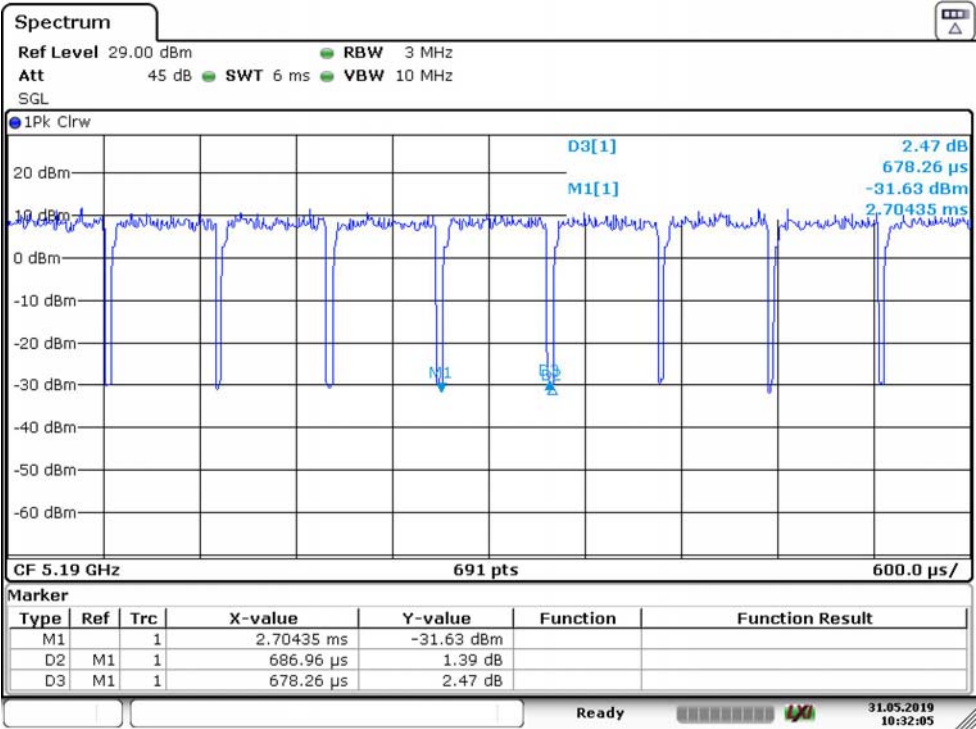
802.11a 5180MHz



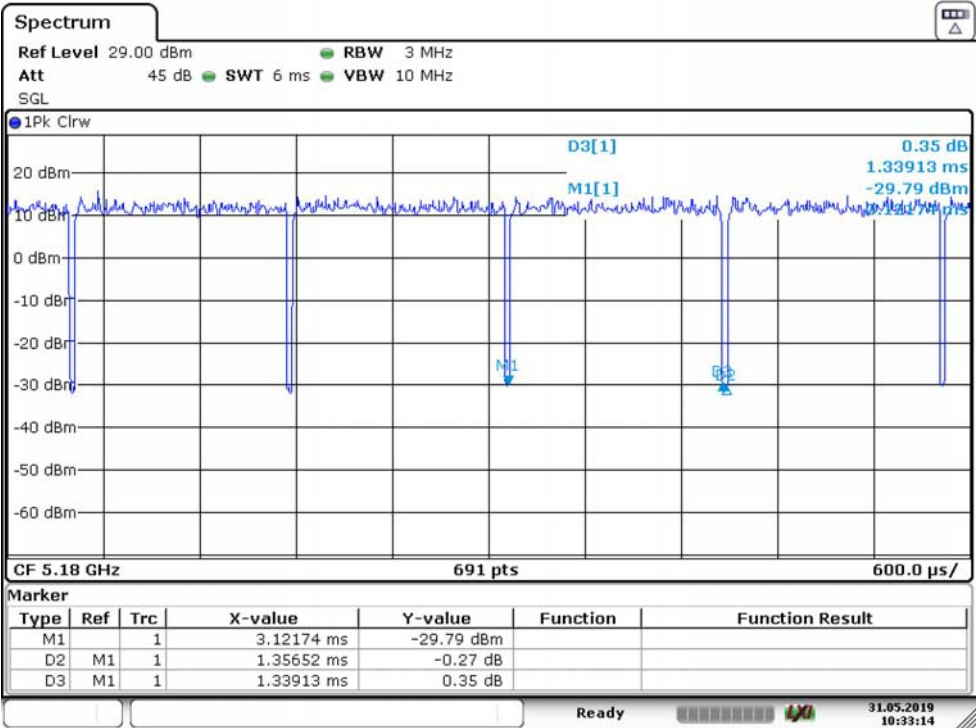
802.11n HT20 5180MHz



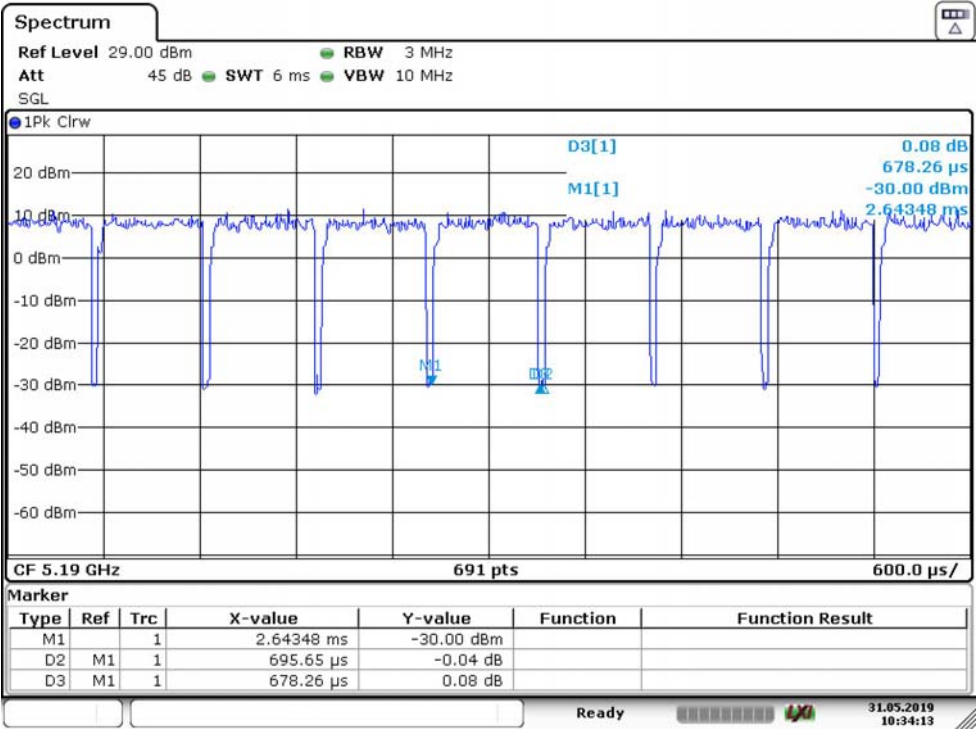
802.11n HT40 5190MHz



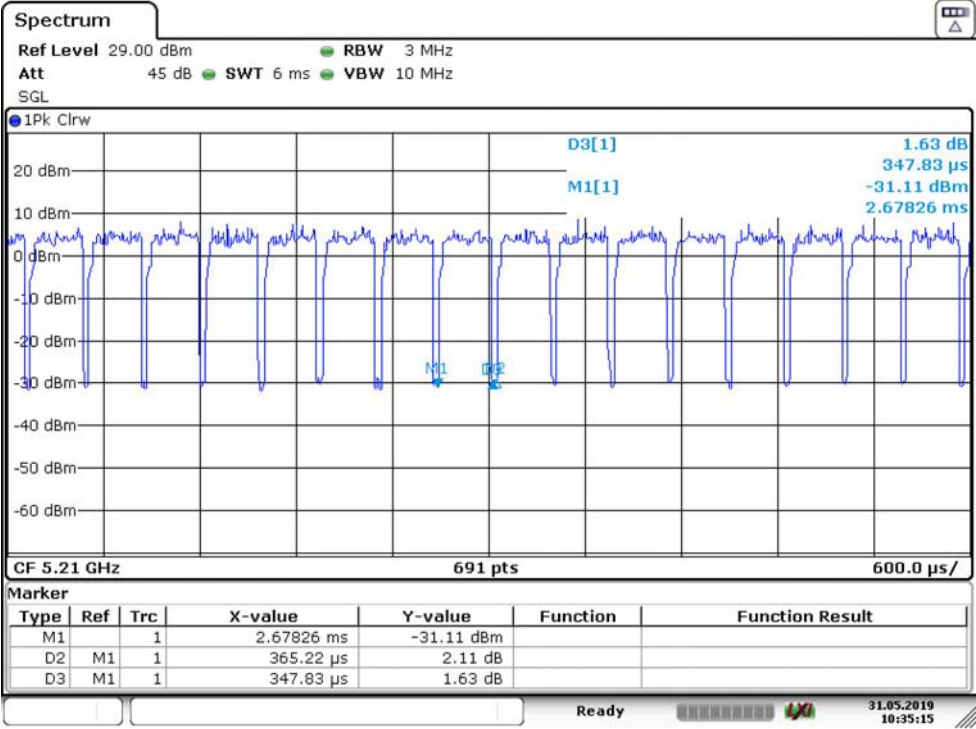
802.11ac VHT20 5180MHz



802.11ac VHT40 5190MHz



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	832354	LISAI	June 15,18	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	101260	LISAI	June 15,18	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101100	LISAI	June 15,18	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	101780	LISAI	June 15,18	1 Year
Active Loop Antenna	SCHWARZB ECK	FMZB 1519B	1519B-088	LISAI	Aug. 01,18	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	101780	LISAI	June 15,18	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	LISAI	June 15,18	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 1GHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	BBHA9120D1002	LISAI	June 18,18	1 Year
Horn Antenna	SCHWARZB ECK	BBHA9170	BBHA9170242	LISAI	June 18,18	1 Year
Signal Amplifier	SCHWARZB ECK	BBV9718	9718-212	LISAI	June 15,18	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSV	103173	LISAI	June 15,18	1 Year
PSA Series Spectrum Analyzer	Agilent	E4447A	MY50180031	LISAI	June 15,18	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

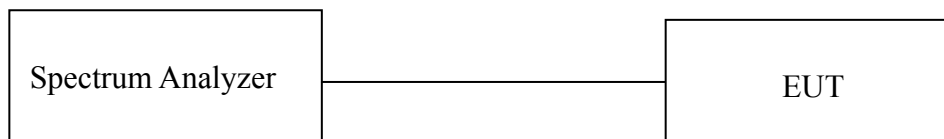
For connect EUT antenna terminal test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
TS 8997	Rohde & Schwarz	/	/	/	/	/
Open Switch and Control Unit	Rohde & Schwarz	OSP-B157WB	101309	LISAI	June 15,18	1 Year
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV	103173	LISAI	June 15,18	1 Year
Signal Generator	Rohde & Schwarz	SMB100A	108752	LISAI	June 15,18	1 Year
Vector Signal Generator	Rohde & Schwarz	SMBV100A	260753	LISAI	June 15,18	1 Year
Test Software	Rohde & Schwarz	WMS32	V10.40.00	N/A	N/A	N/A
Spectrum Analyzer	Agilent	E4408B	MY44211 139	LISAI	May 26,19	1 Year
Temperature controller	DK	DK70A	006562	LISAI	June 15,18	1 Year
AC Source	CHANGJIA NG	3KV	EST215-0 07	N/A	N/A	N/A

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 $\geq$ 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 :

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 3.3.
- Set the EUT transmit continuously with maximum output power.
- 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%.
- Repeat above procedures until all modes and channels were measured.
- Record the results in the test report.

For 6dB Bandwidth Measurement :

- Connect EUT antenna terminal to the spectrum analyzer with RF cable.
- Spectrum analyzer setting parameters in accordance with section 3.3.
- Set the EUT transmit continuously with maximum output power.
- 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.
- Repeat above procedures until all modes and channels were measured.
- Record the results in the test report.

For 99% Occupied Bandwidth Measurement :

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

3.5. Test Result

Temperature	25℃	Relative Humidity			55%	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	802.11a	5180	21.939	21.881	17.168	17.135		
		5200	21.766	21.708	17.181	17.192		
		5240	21.881	21.766	17.008	17.077		
	802.11n HT20	5180	22.229	21.881	18.207	18.234		
		5200	21.997	21.939	18.207	18.292		
		5240	21.881	21.823	18.167	18.119		
	802.11ac VHT20	5180	21.939	21.881	18.167	18.177		
		5200	21.881	21.881	18.221	18.177		
		5240	22.055	22.055	18.207	18.177		
	802.11n HT40	5190	40.463	40.637	36.868	36.932		
		5230	40.550	40.637	36.868	36.932		
	802.11ac VHT40	5190	40.550	40.550	36.868	36.932		
		5230	40.550	40.289	36.894	36.932		
	802.11ac VHT80	5210	82.490	82.490	75.815	75.716		
U-NII-2A	802.11a	5260	21.766	21.881	17.101	17.135	0.2500	23.98
		5300	21.939	21.766	17.261	17.192	0.2500	23.98
		5320	21.766	21.708	17.168	17.019	0.2500	23.98
	802.11n HT20	5260	21.997	22.113	18.194	18.119	0.2500	23.98
		5300	22.113	21.881	18.141	18.177	0.2500	23.98
		5320	22.055	21.997	18.101	18.177	0.2500	23.98
	802.11ac VHT20	5260	21.939	21.997	18.181	18.119	0.2500	23.98
		5300	21.997	22.055	18.087	18.177	0.2500	23.98
		5320	22.055	21.939	18.207	18.119	0.2500	23.98
	802.11n HT40	5270	40.550	40.637	36.868	36.932	0.2500	23.98
		5310	40.810	40.376	36.868	36.932	0.2500	23.98
	802.11ac VHT40	5270	40.637	40.289	36.868	36.932	0.2500	23.98
		5310	40.637	40.376	36.841	36.932	0.2500	23.98
	802.11ac VHT80	5290	83.010	82.140	75.855	75.890	0.2500	23.98
U-NII-2C	802.11a	5500	21.823	21.592	17.181	17.135	0.2500	23.98
		5580	21.823	21.766	17.221	17.077	0.2500	23.98
		5700	21.766	21.592	17.234	17.192	0.2500	23.98
	802.11n HT20	5500	21.939	21.939	18.301	18.119	0.2500	23.98
		5580	22.113	22.171	18.301	18.234	0.2500	23.98
		5700	22.171	21.997	18.314	18.119	0.2500	23.98
	802.11ac VHT20	5500	21.881	22.055	18.167	18.061	0.2500	23.98
		5580	22.113	22.113	18.207	18.119	0.2500	23.98
		5700	21.997	21.939	18.221	18.234	0.2500	23.98
	802.11n HT40	5510	40.376	40.463	36.788	36.932	0.2500	23.98
		5670	40.550	40.463	36.841	37.048	0.2500	23.98
	802.11ac VHT40	5510	40.637	40.463	36.841	36.932	0.2500	23.98
		5670	40.637	40.550	36.894	37.048	0.2500	23.98
	802.11ac VHT80	5530	82.490	82.490	75.895	75.890	0.2500	23.98

Temperature	25℃	Relative Humidity			55%	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	802.11a	5745	16.354	16.354	17.061	17.250	0.5	PASS
		5785	16.354	16.354	17.194	17.135	0.5	PASS
		5825	16.354	16.354	17.048	17.135	0.5	PASS
	802.11n HT20	5745	17.608	17.448	18.247	18.292	0.5	PASS
		5785	17.608	17.608	18.261	18.234	0.5	PASS
		5825	17.608	17.608	18.287	18.292	0.5	PASS
	802.11ac VHT20	5745	17.608	17.608	18.114	18.119	0.5	PASS
		5785	17.608	17.608	18.181	18.234	0.5	PASS
		5825	17.608	17.608	18.314	18.177	0.5	PASS
	802.11n HT40	5755	36.338	36.338	36.894	37.048	0.5	PASS
		5795	36.355	36.171	36.868	37.048	0.5	PASS
	802.11ac VHT40	5755	36.338	36.338	36.894	37.048	0.5	PASS
		5795	36.204	36.104	36.868	37.048	0.5	PASS
	802.11ac VHT80	5775	75.974	75.842	75.975	76.064	0.5	PASS

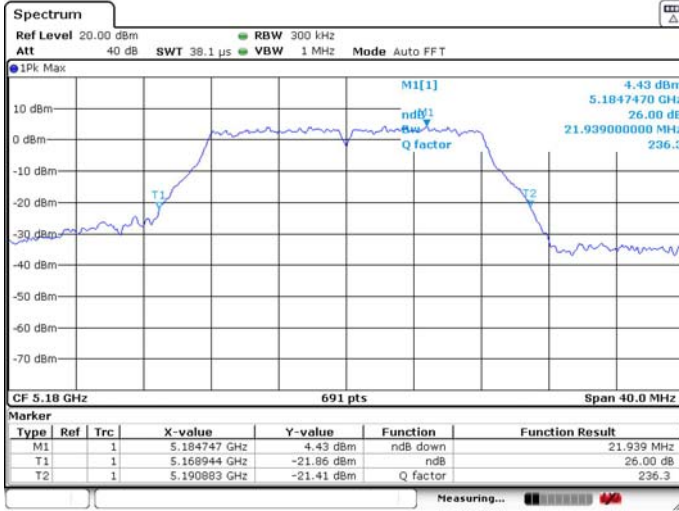
Note :

For Band U-NII-2A and U-NII-2C,the maximum conducted output power limit is 250mw or $11+10 \times \log B$, 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.

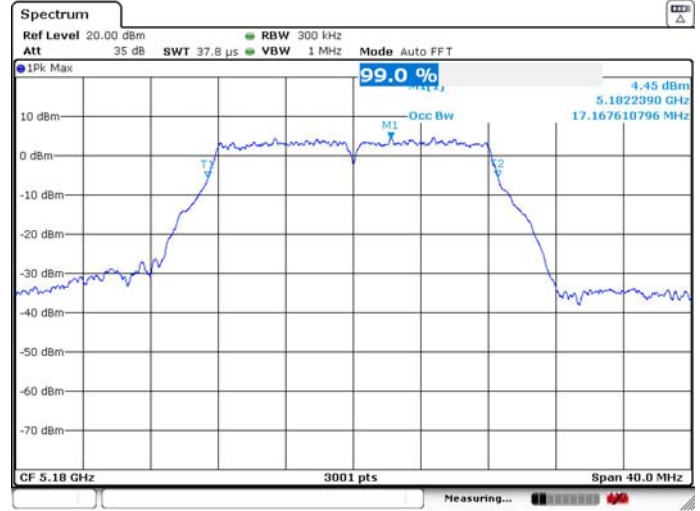
3.6. Test Result

U-NII-1 802.11a 5180MHz_Ant 1

26dB Bandwidth

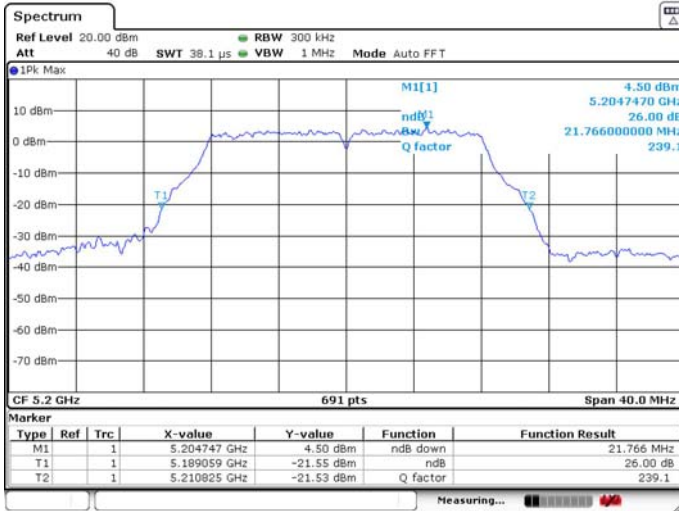


99% Occupied Bandwidth

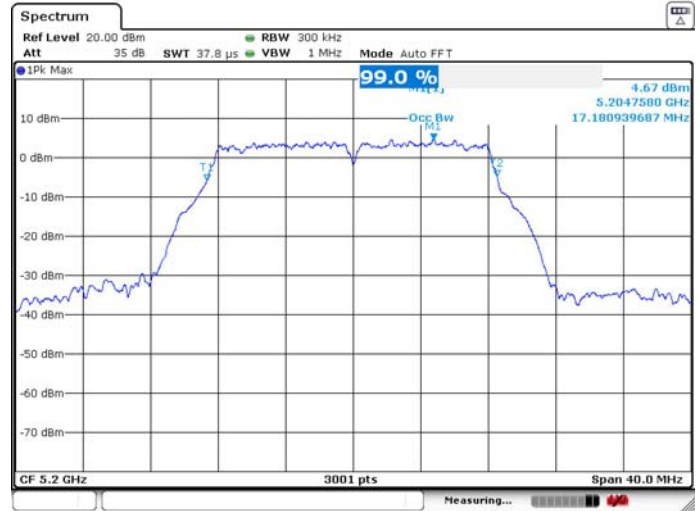


U-NII-1 802.11a 5200MHz_Ant 1

26dB Bandwidth

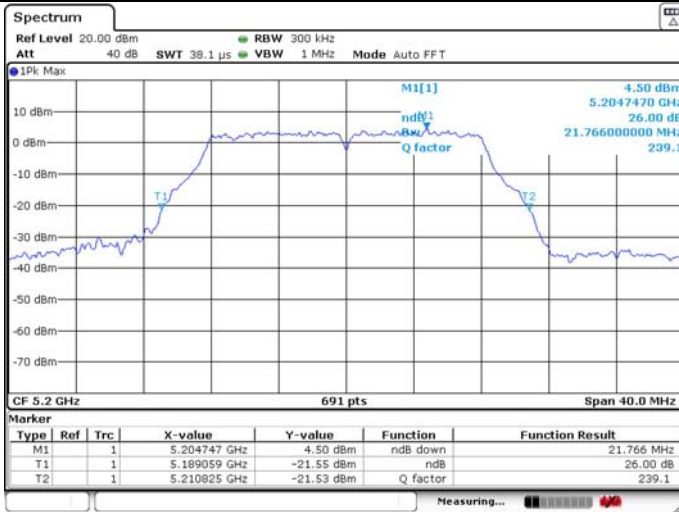


99% Occupied Bandwidth

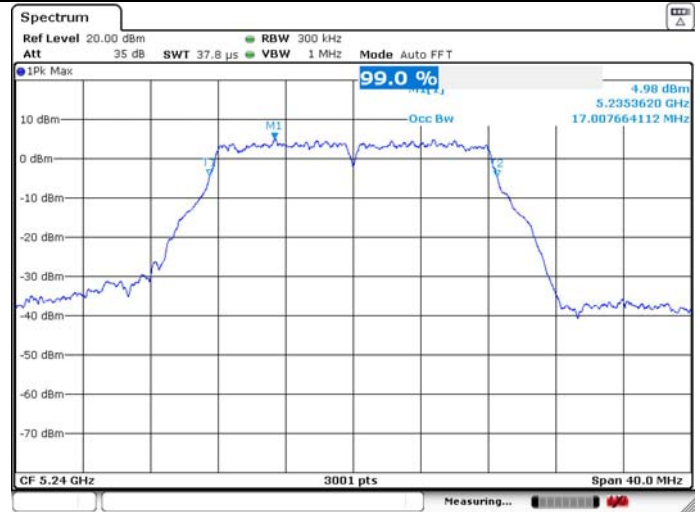


U-NII-1 802.11a 5240MHz_Ant 1

26dB Bandwidth



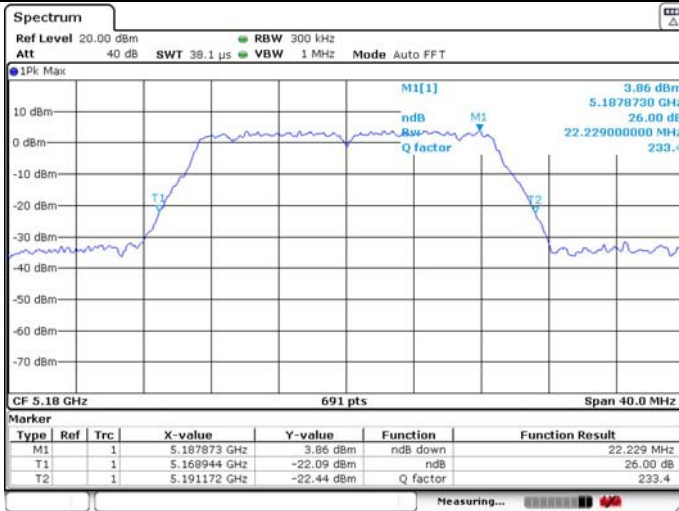
99% Occupied Bandwidth



U-NII-1 802.11n HT20 5180MHz_Ant 1

26dB Bandwidth

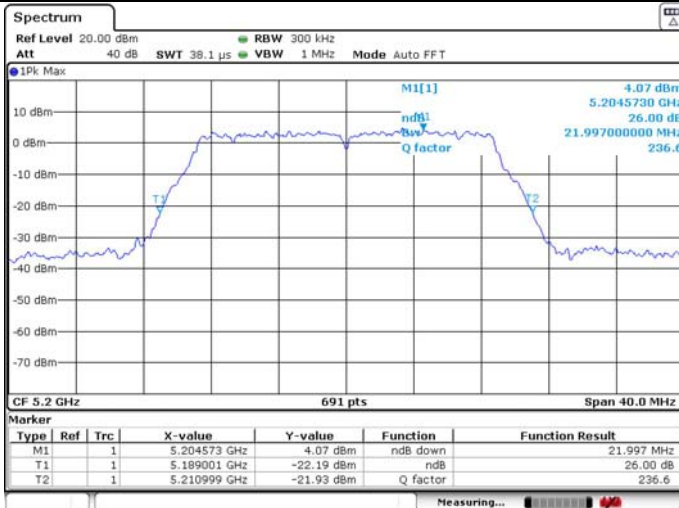
99% Occupied Bandwidth



U-NII-1 802.11n HT20 5200MHz_Ant 1

26dB Bandwidth

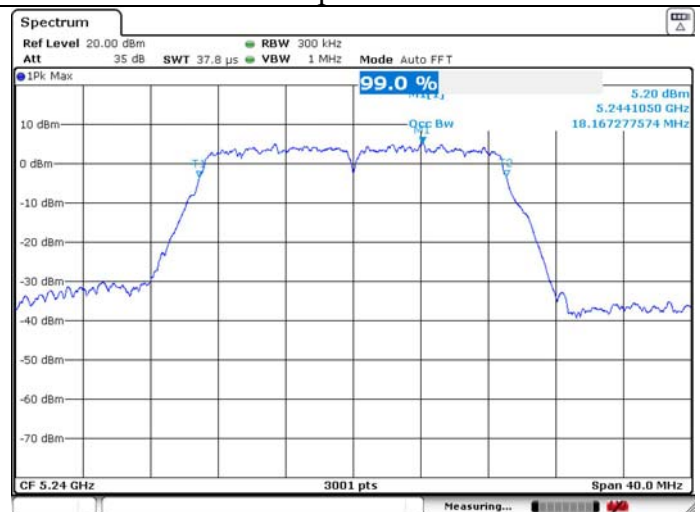
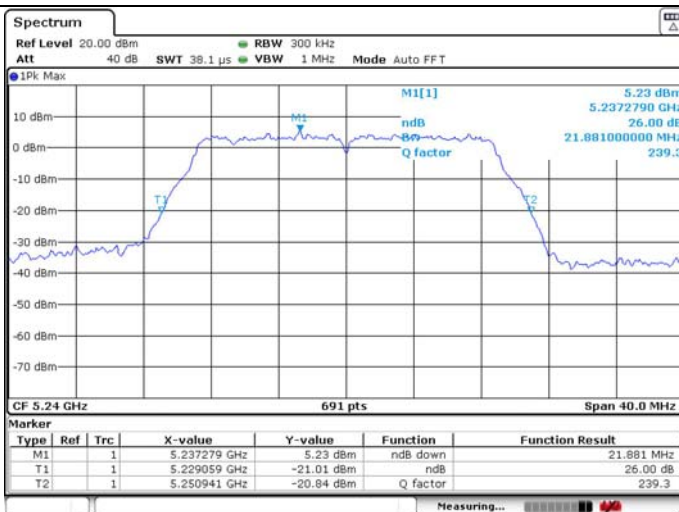
99% Occupied Bandwidth



U-NII-1 802.11n HT20 5240MHz_Ant 1

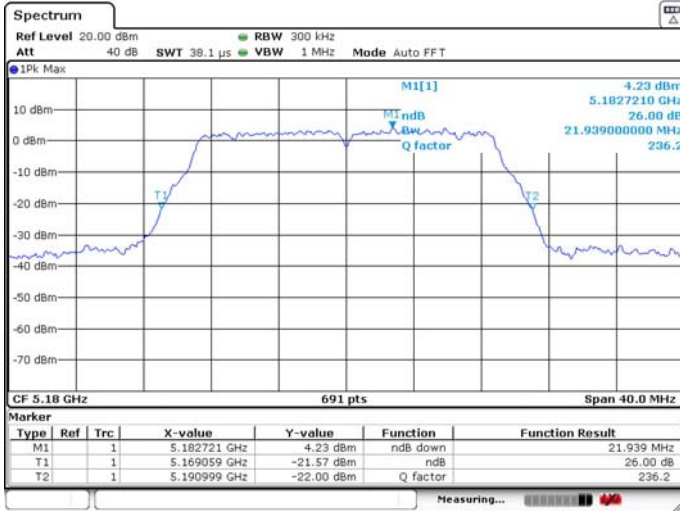
26dB Bandwidth

99% Occupied Bandwidth

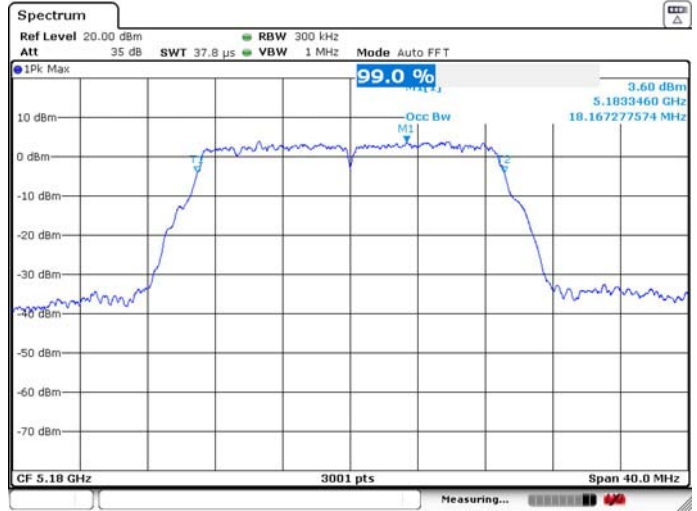


U-NII-1 802.11ac VHT20 5180MHz_Ant 1

26dB Bandwidth

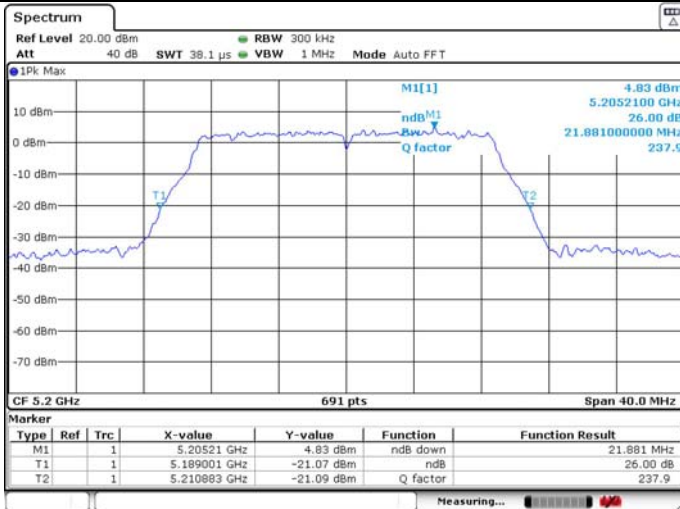


99% Occupied Bandwidth



U-NII-1 802.11ac VHT20 5200MHz_Ant 1

26dB Bandwidth

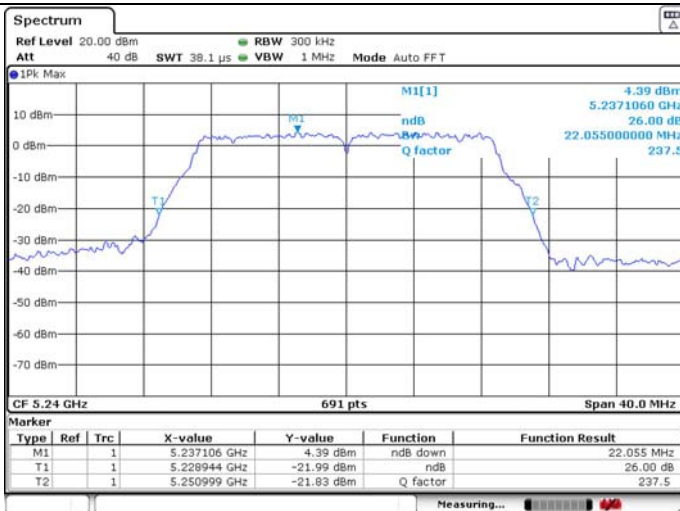


99% Occupied Bandwidth

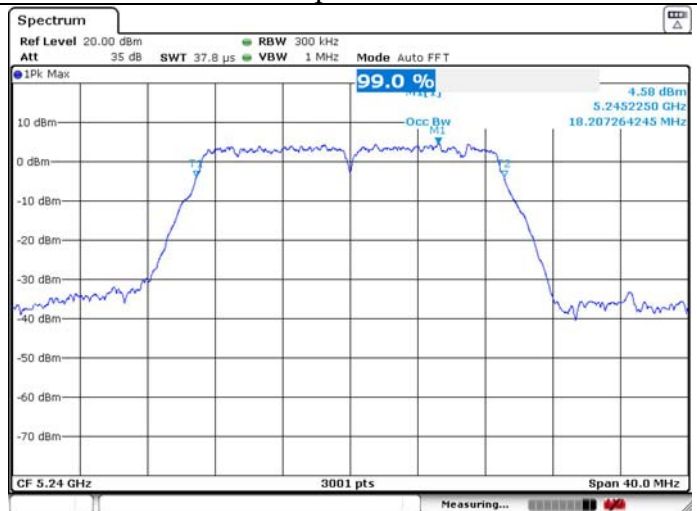


U-NII-1 802.11ac VHT20 5240MHz_Ant 1

26dB Bandwidth



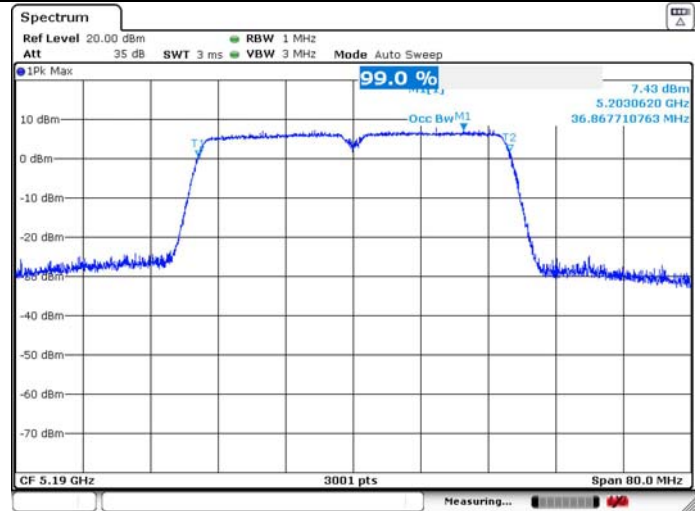
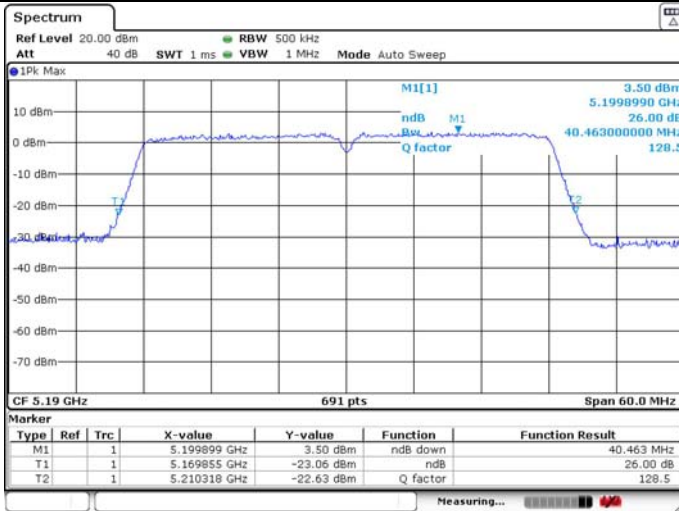
99% Occupied Bandwidth



U-NII-1 802.11n HT40 5190MHz_Ant 1

26dB Bandwidth

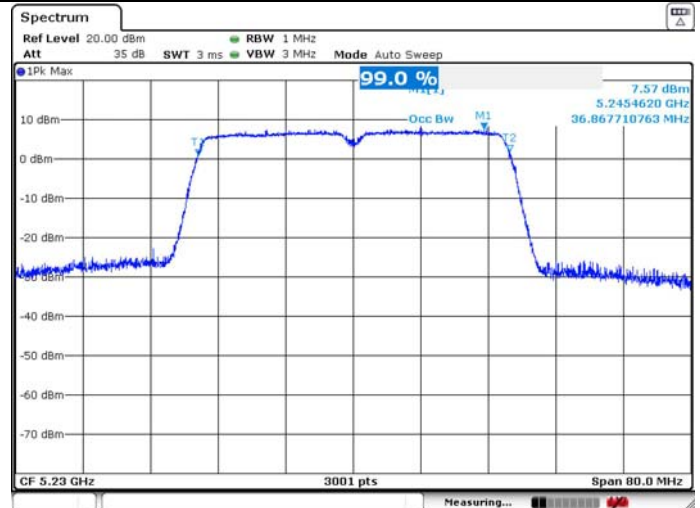
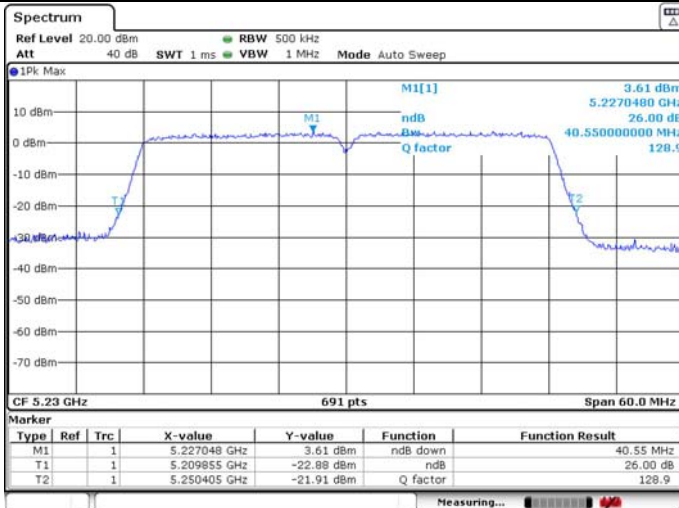
99% Occupied Bandwidth



U-NII-1 802.11n HT40 5230MHz_Ant 1

26dB Bandwidth

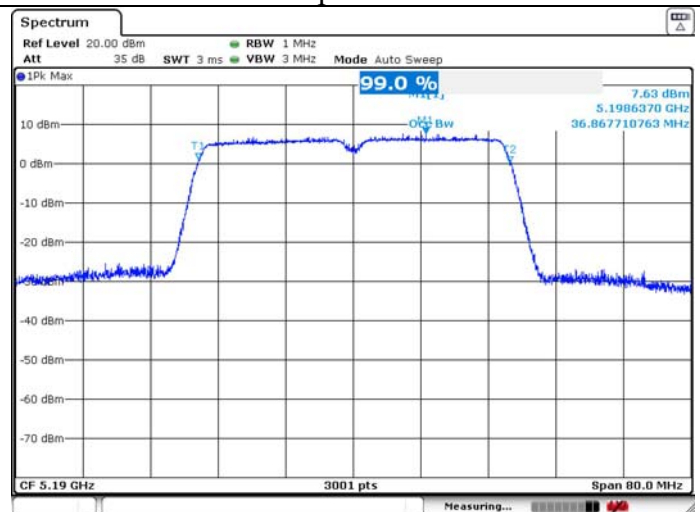
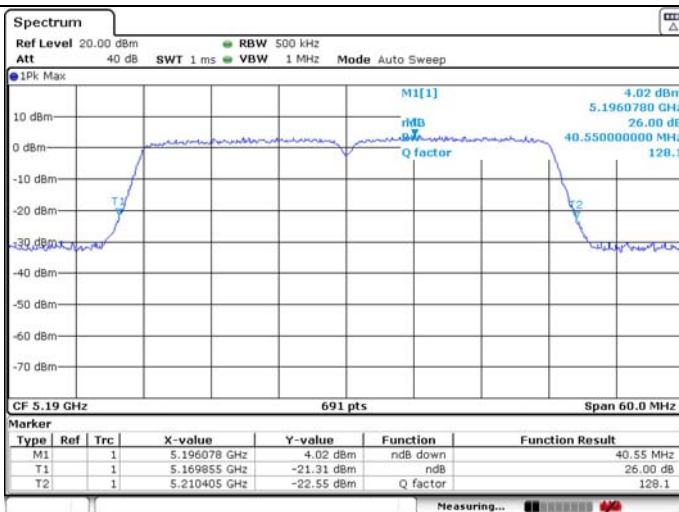
99% Occupied Bandwidth

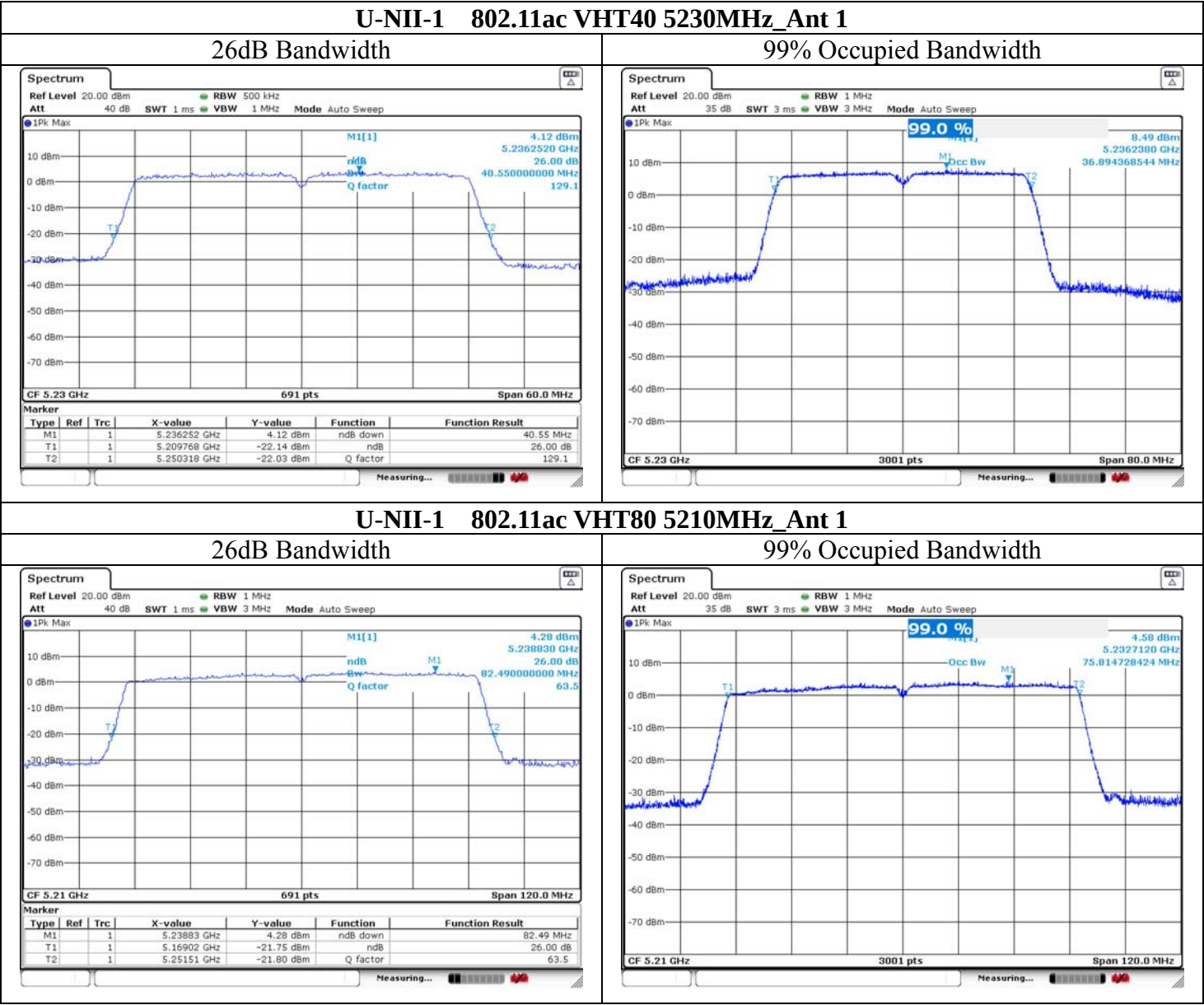


U-NII-1 802.11ac VHT40 5190MHz_Ant 1

26dB Bandwidth

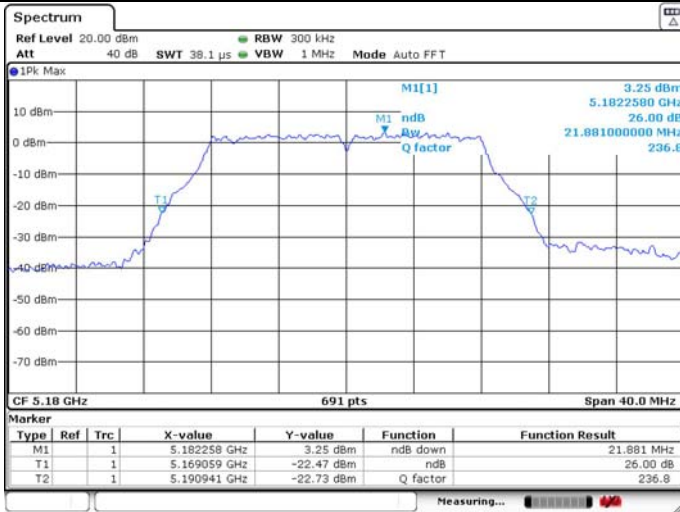
99% Occupied Bandwidth





U-NII-1 802.11a 5180MHz_Ant 2

26dB Bandwidth

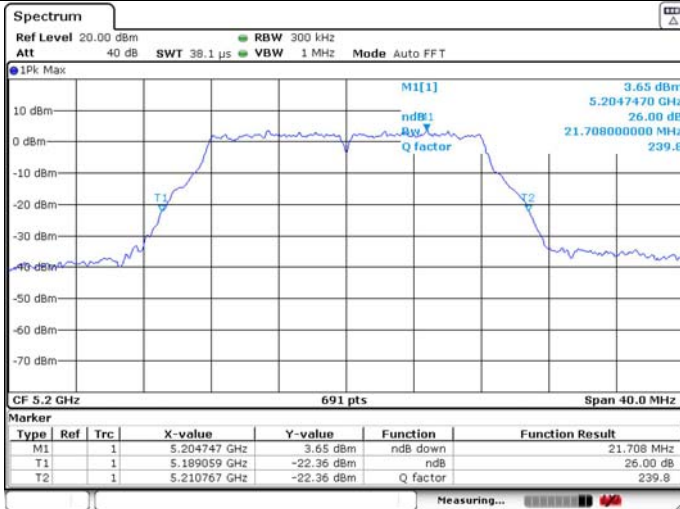


99% Occupied Bandwidth



U-NII-1 802.11a 5200MHz_Ant 2

26dB Bandwidth

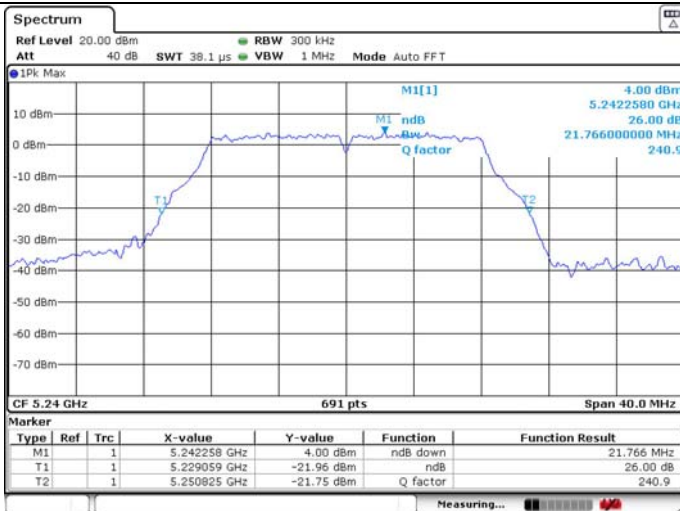


99% Occupied Bandwidth



U-NII-1 802.11a 5240MHz_Ant 2

26dB Bandwidth



99% Occupied Bandwidth



U-NII-1 802.11n HT20 5180MHz_Ant 2

26dB Bandwidth

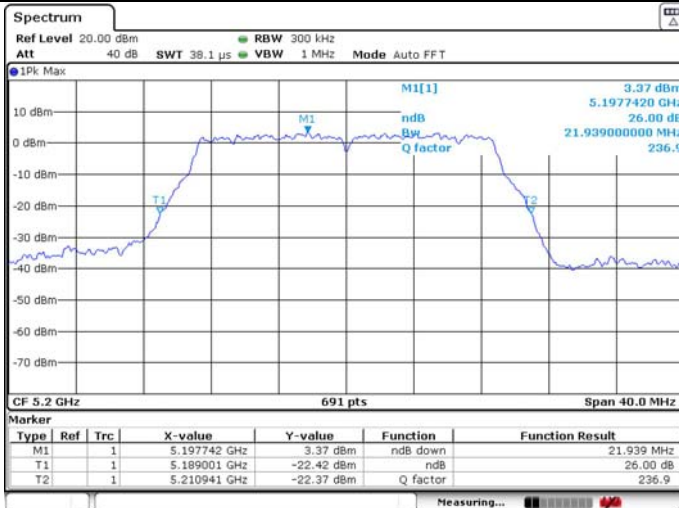
99% Occupied Bandwidth



U-NII-1 802.11n HT20 5200MHz_Ant 2

26dB Bandwidth

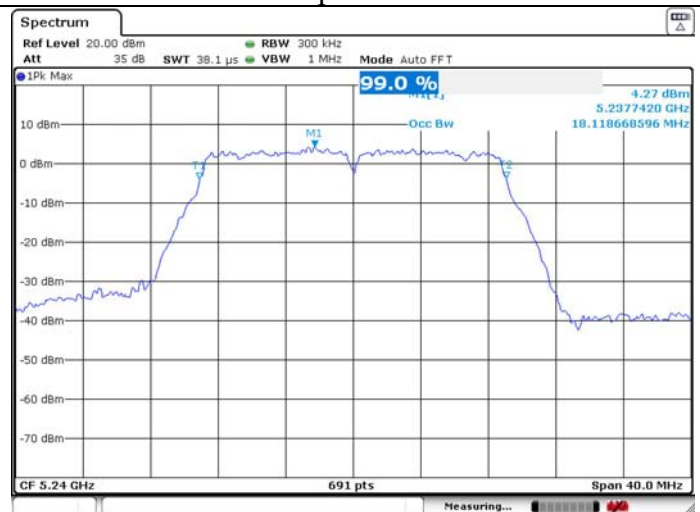
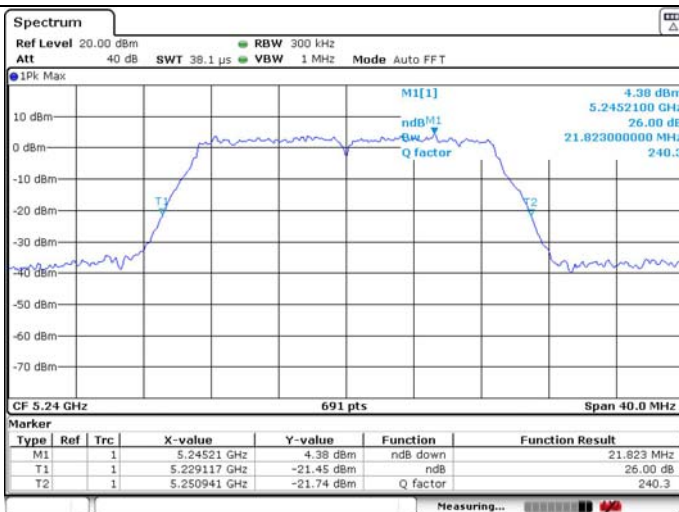
99% Occupied Bandwidth

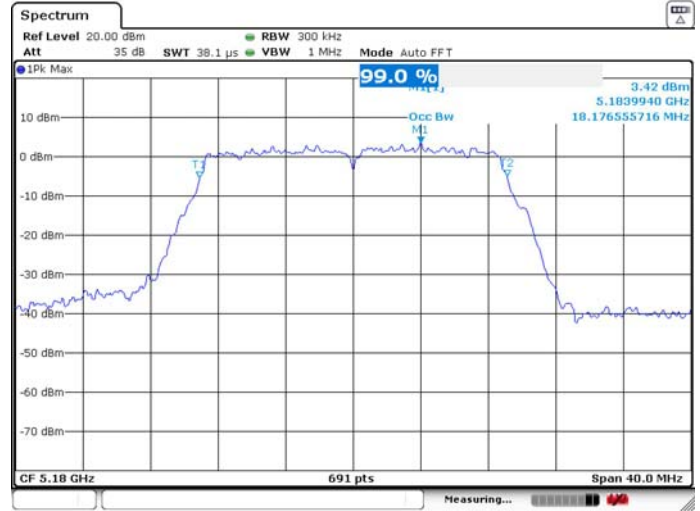
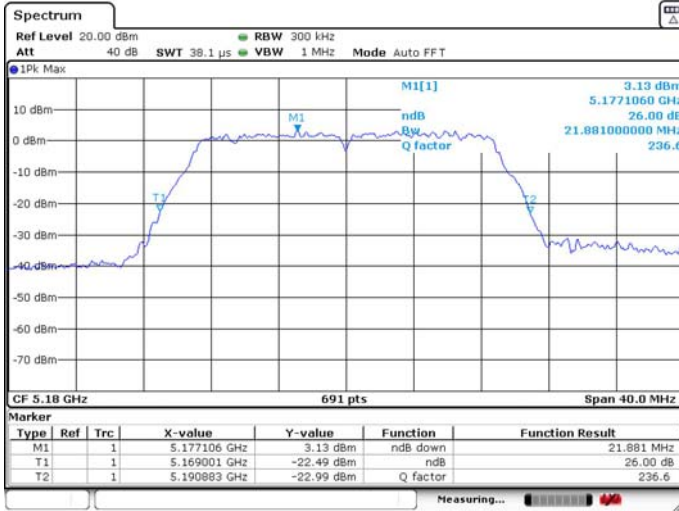
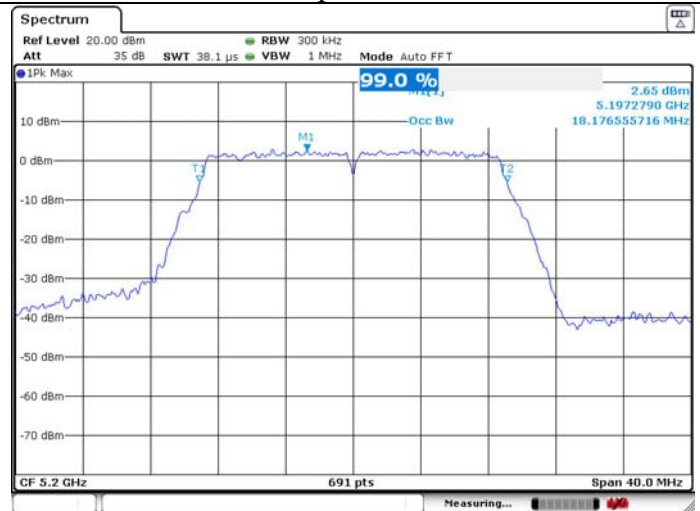
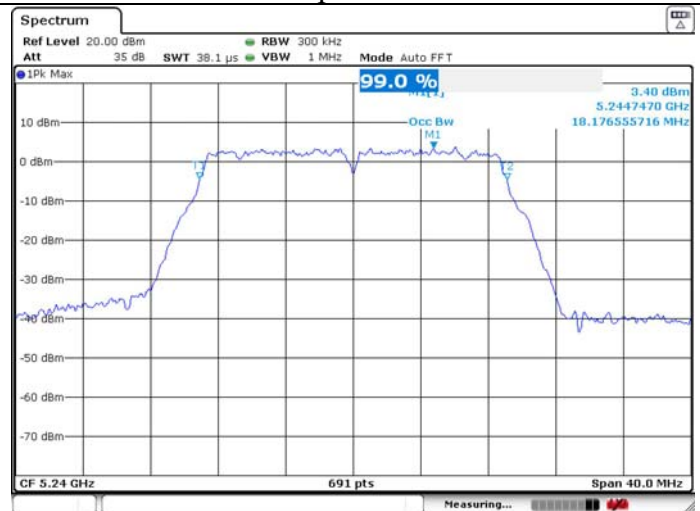
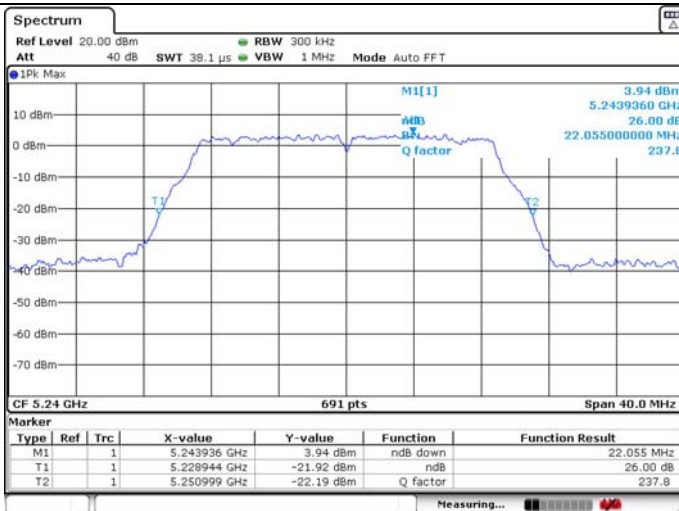


U-NII-1 802.11n HT20 5240MHz_Ant 2

26dB Bandwidth

99% Occupied Bandwidth

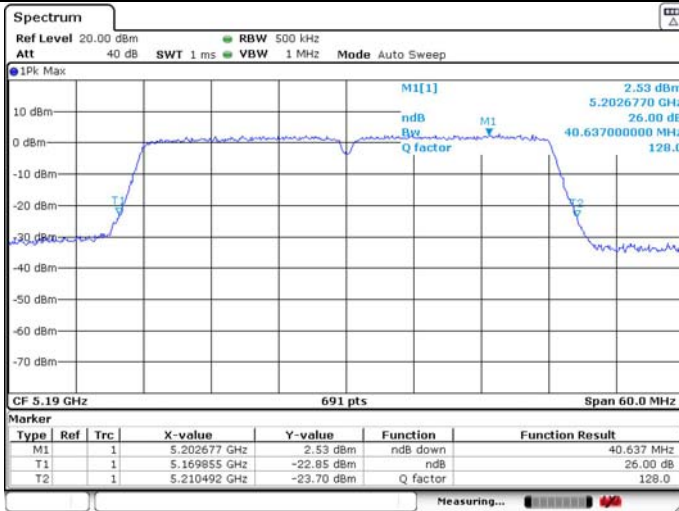


U-NII-1 802.11ac VHT20 5180MHz_Ant 2**26dB Bandwidth****99% Occupied Bandwidth****U-NII-1 802.11ac VHT20 5200MHz_Ant 2****26dB Bandwidth****99% Occupied Bandwidth****U-NII-1 802.11ac VHT20 5240MHz_Ant 2****26dB Bandwidth****99% Occupied Bandwidth**

U-NII-1 802.11n HT40 5190MHz_Ant 2

26dB Bandwidth

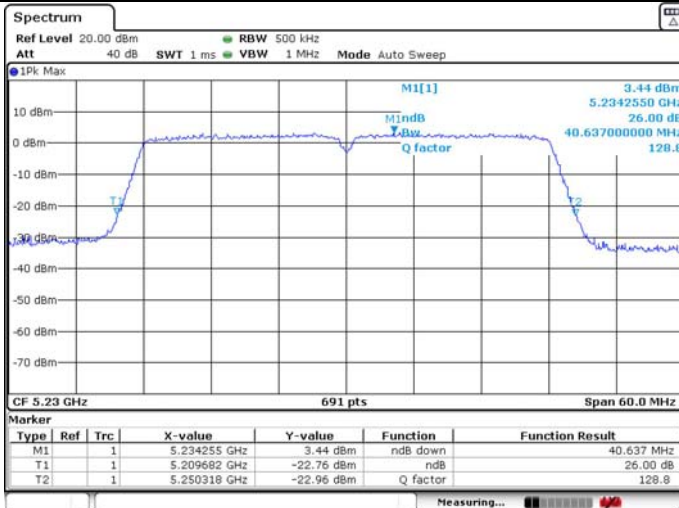
99% Occupied Bandwidth



U-NII-1 802.11n HT40 5230MHz_Ant 2

26dB Bandwidth

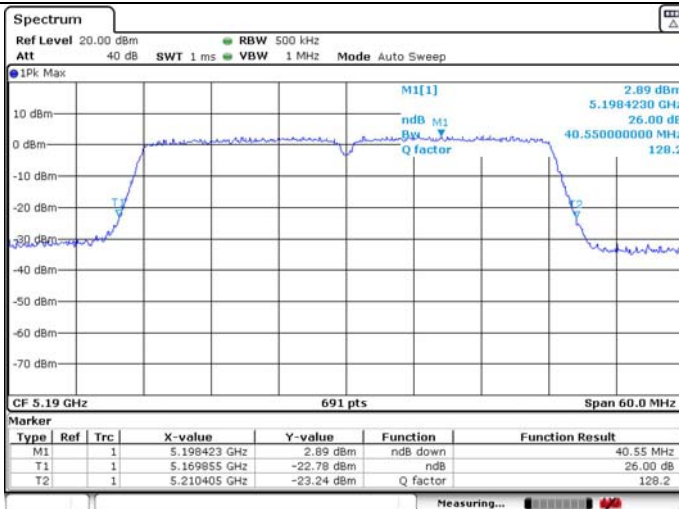
99% Occupied Bandwidth

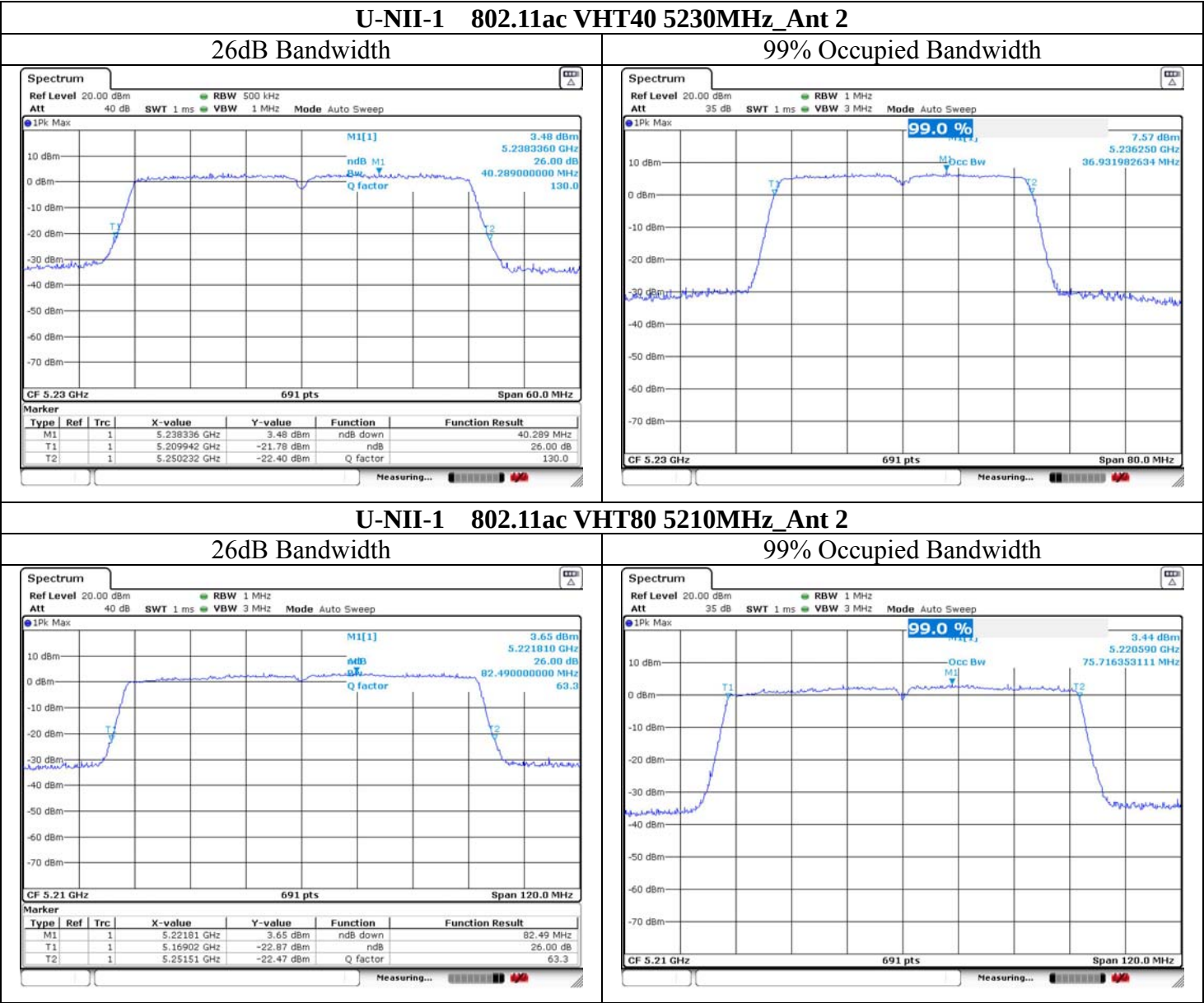


U-NII-1 802.11ac VHT40 5190MHz_Ant 2

26dB Bandwidth

99% Occupied Bandwidth





U-NII-1 802.11ac VHT80 5210MHz_Ant 2

26dB Bandwidth

Spectrum

Ref Level 20.00 dBm Att 40 dB RBW 1 MHz VBW 3 MHz Mode Auto Sweep

1Pk Max

M1[1] 3.65 dBm 5.221810 GHz 26.00 dB 82.490000000 MHz 63.3

ndB

Q factor

CF 5.21 GHz 691 pts Span 120.0 MHz

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1	1	5.22181 GHz	3.65 dBm	ndB down	82.49 MHz
T1	1	1	5.16902 GHz	-22.87 dBm	ndB	26.00 dB
T2	1	1	5.25151 GHz	-22.47 dBm	Q factor	63.3

Measuring...

99% Occupied Bandwidth

Spectrum

Ref Level 20.00 dBm Att 35 dB RBW 1 MHz VBW 3 MHz Mode Auto Sweep

1Pk Max

99.0 %

M1 3.44 dBm 5.220590 GHz 75.716353111 MHz

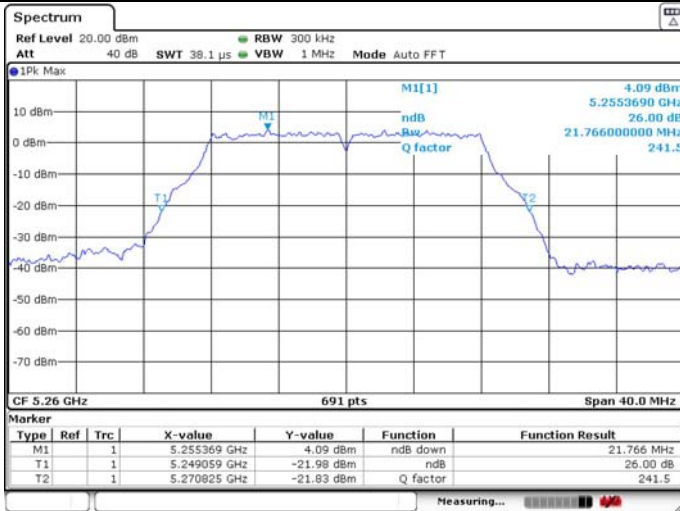
M1cc Bw

CF 5.21 GHz 691 pts Span 120.0 MHz

Measuring...

U-NII-2A 802.11a 5260MHz_Ant 1

26dB Bandwidth

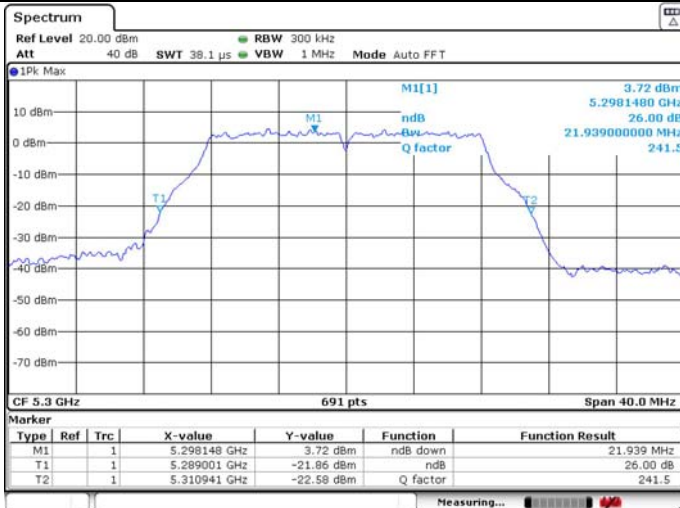


99% Occupied Bandwidth

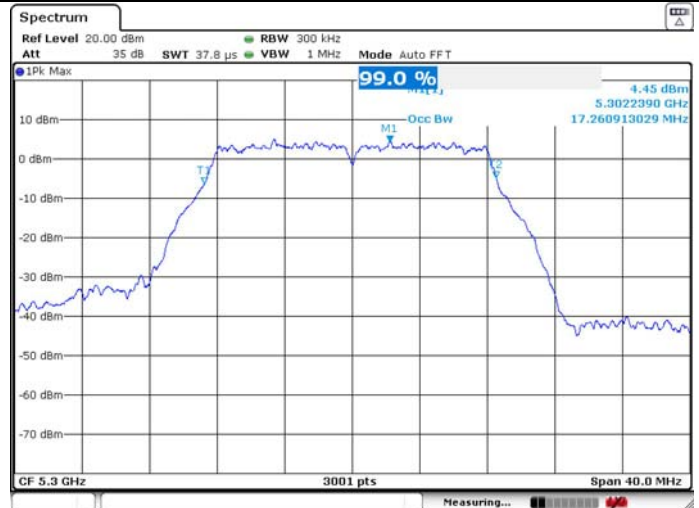


U-NII-2A 802.11a 5300MHz_Ant 1

26dB Bandwidth

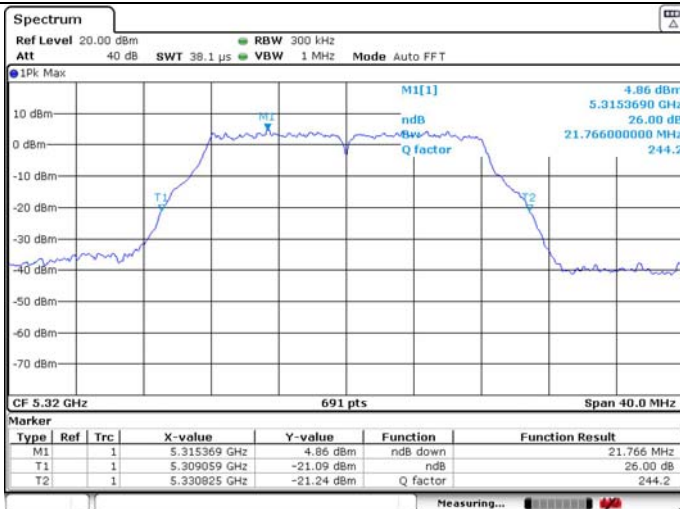


99% Occupied Bandwidth

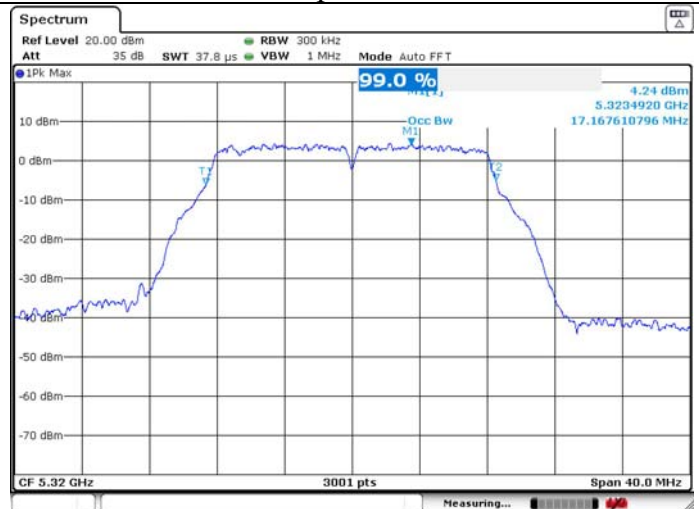


U-NII-2A 802.11a 5320MHz_Ant 1

26dB Bandwidth

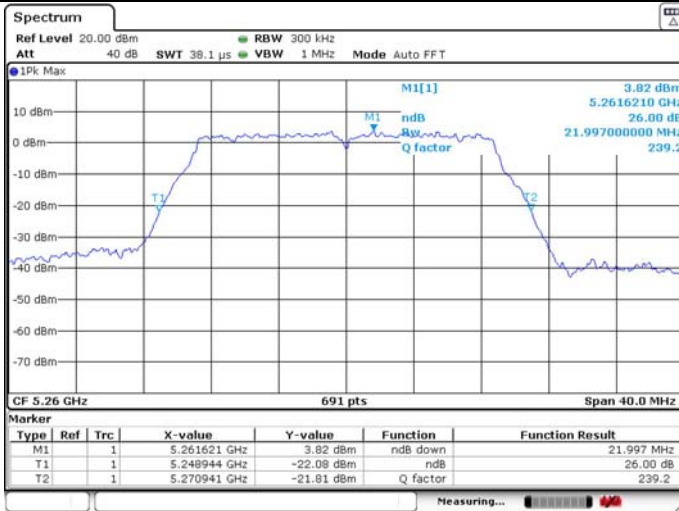


99% Occupied Bandwidth



U-NII-2A 802.11n HT20 5260MHz_Ant 1

26dB Bandwidth

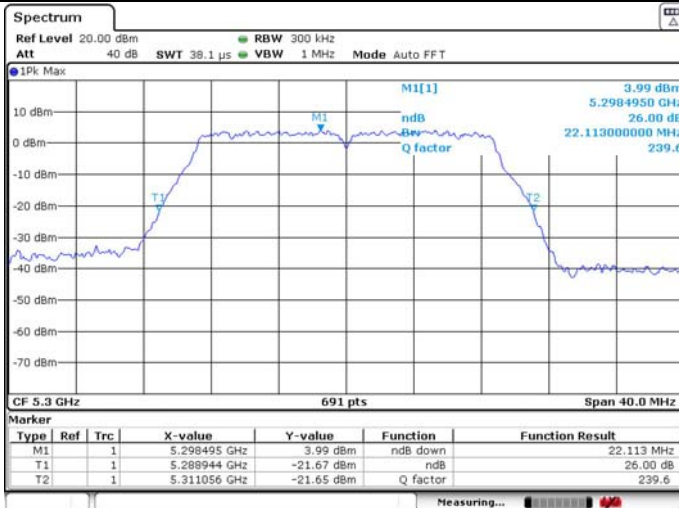


99% Occupied Bandwidth



U-NII-2A 802.11n HT20 5300MHz_Ant 1

26dB Bandwidth

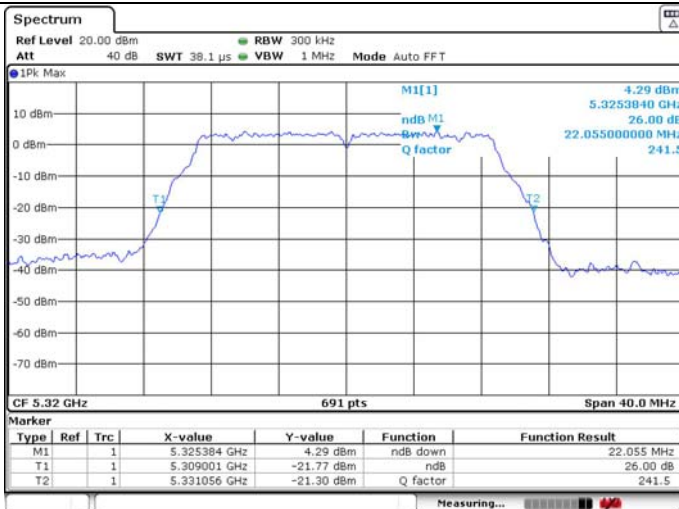


99% Occupied Bandwidth

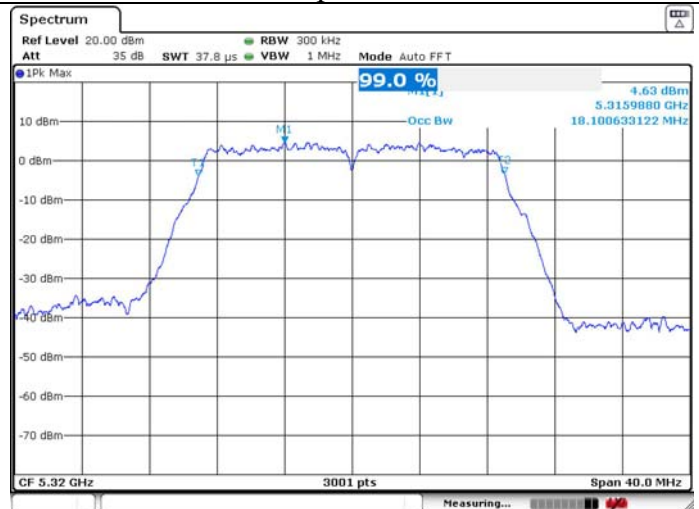


U-NII-2A 802.11n HT20 5320MHz_Ant 1

26dB Bandwidth



99% Occupied Bandwidth



U-NII-2A 802.11ac VHT20 5260MHz_Ant 1

26dB Bandwidth

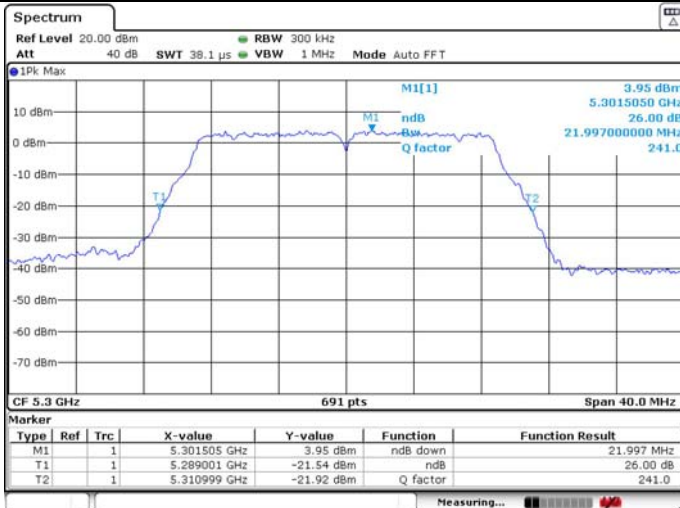


99% Occupied Bandwidth

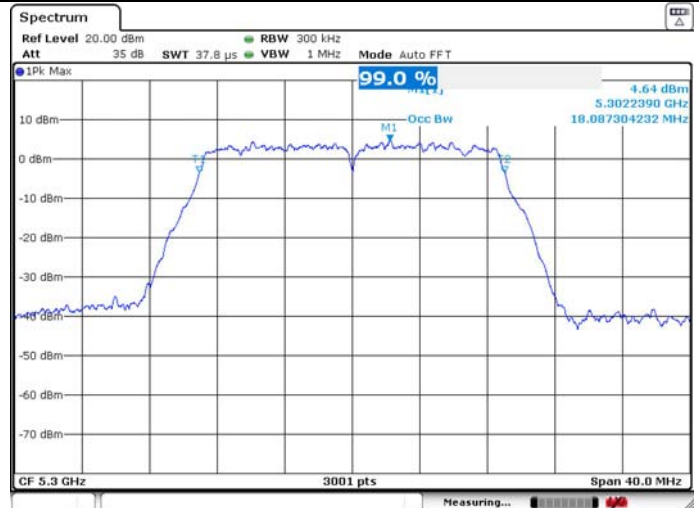


U-NII-2A 802.11ac VHT20 5300MHz_Ant 1

26dB Bandwidth

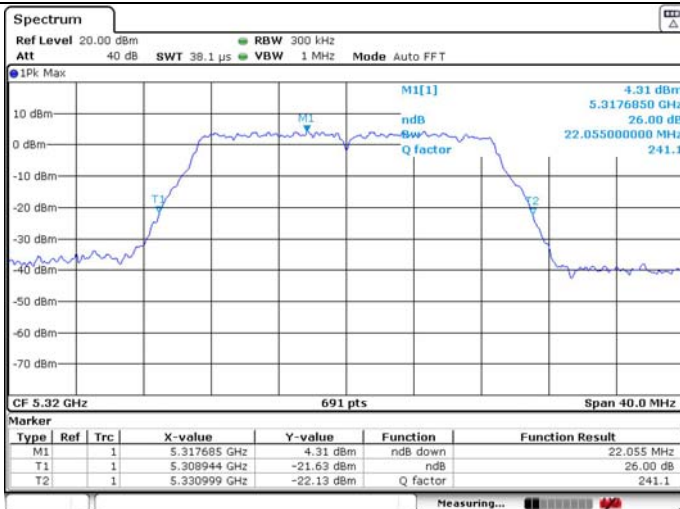


99% Occupied Bandwidth

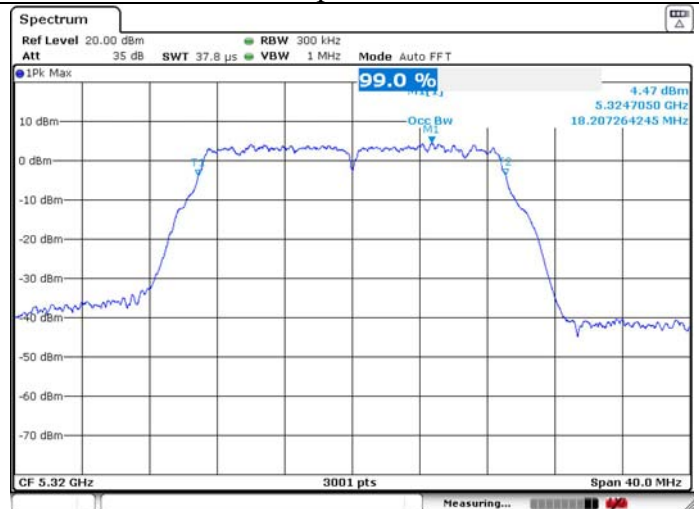


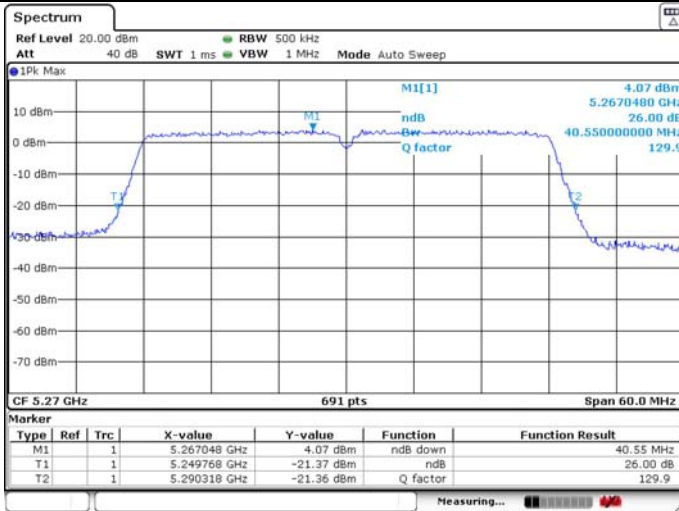
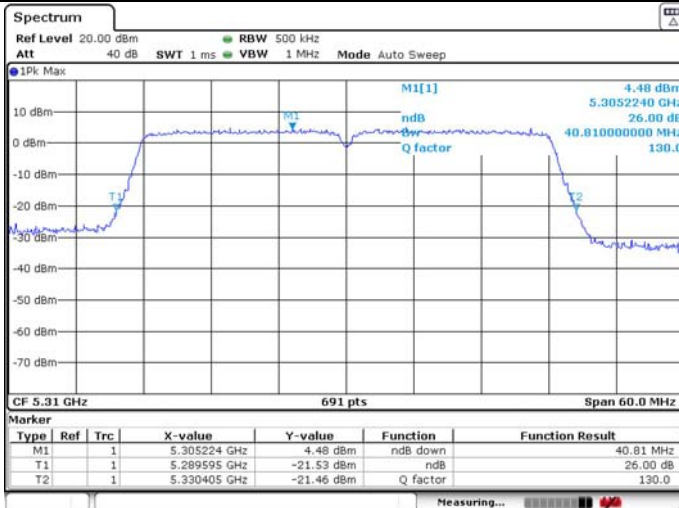
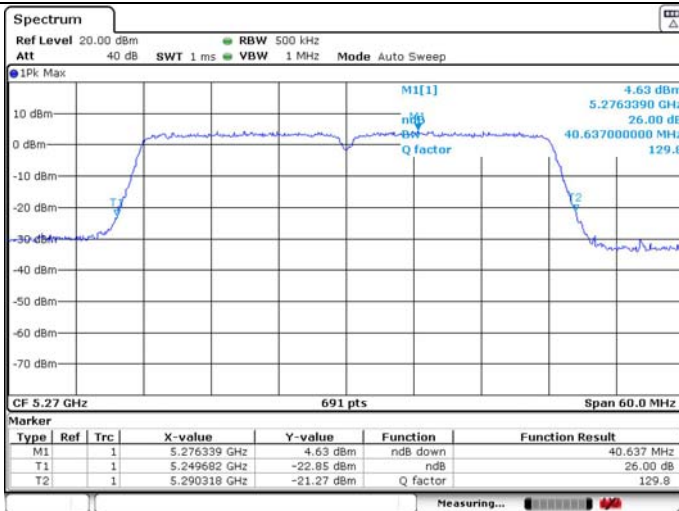
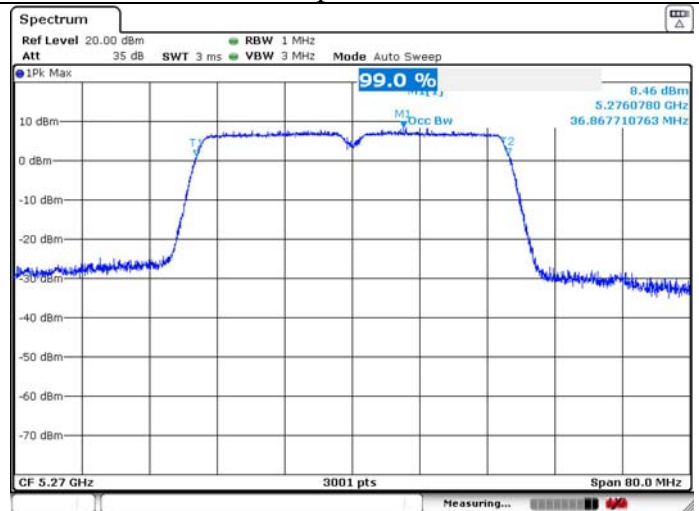
U-NII-2A 802.11ac VHT20 5320MHz_Ant 1

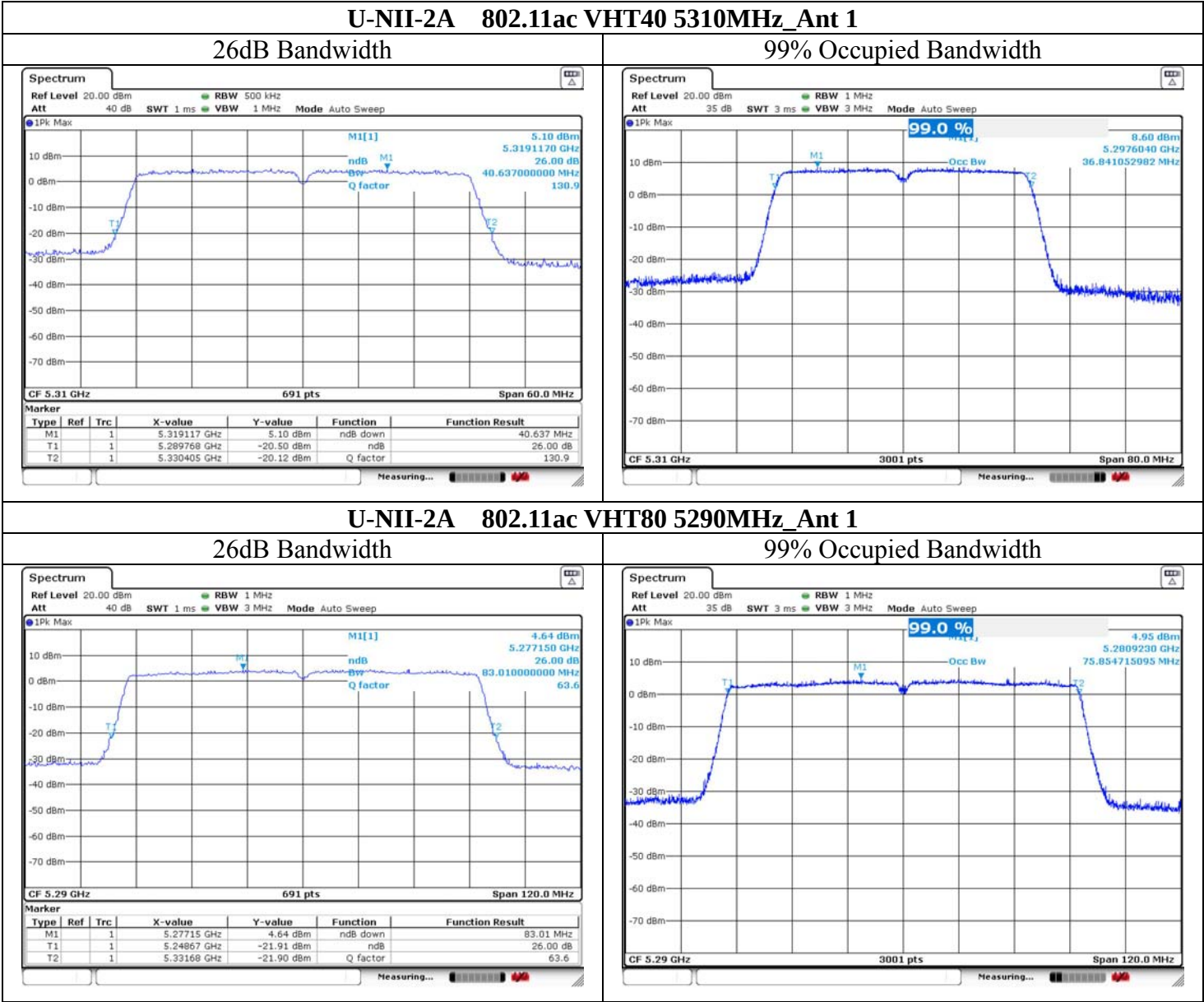
26dB Bandwidth



99% Occupied Bandwidth

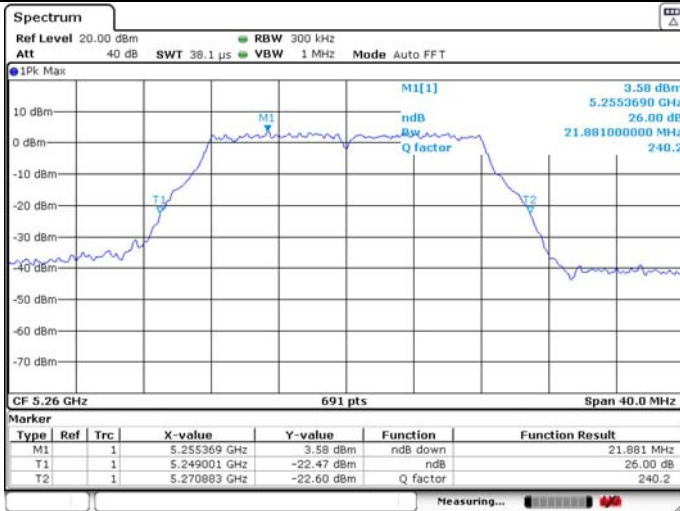


U-NII-2A 802.11n HT40 5270MHz_Ant 1**26dB Bandwidth****99% Occupied Bandwidth****U-NII-2A 802.11n HT40 5310MHz_Ant 1****26dB Bandwidth****99% Occupied Bandwidth****U-NII-2A 802.11ac VHT40 5270MHz_Ant 1****26dB Bandwidth****99% Occupied Bandwidth**



U-NII-2A 802.11a 5260MHz_Ant 2

26dB Bandwidth

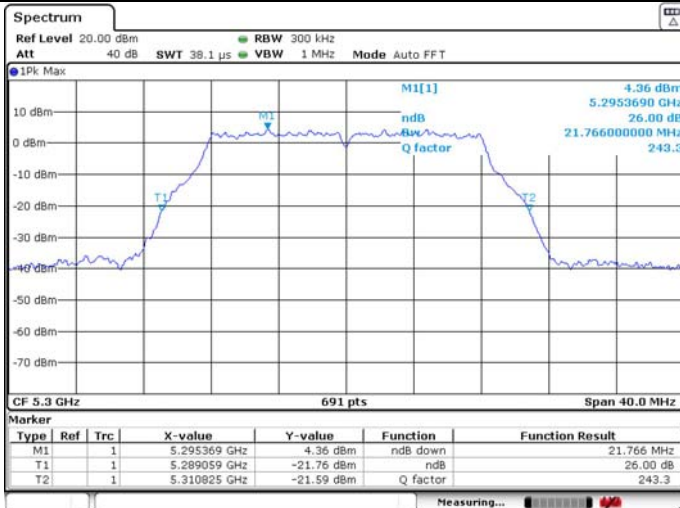


99% Occupied Bandwidth



U-NII-2A 802.11a 5300MHz_Ant 2

26dB Bandwidth

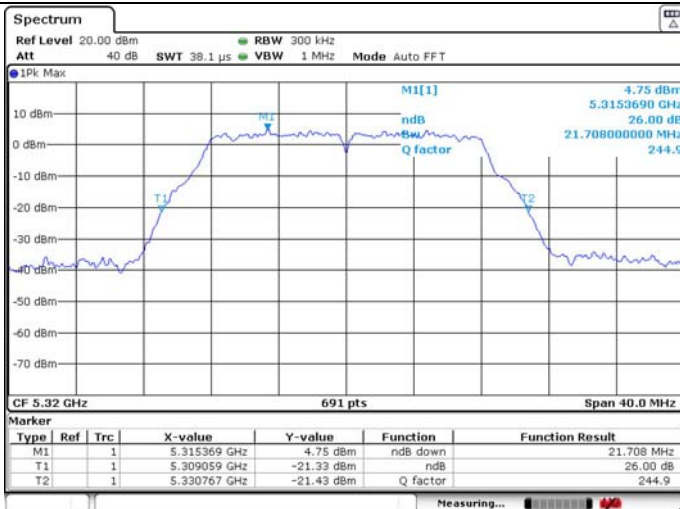


99% Occupied Bandwidth



U-NII-2A 802.11a 5320MHz_Ant 2

26dB Bandwidth



99% Occupied Bandwidth

