

FCC PART 15E TEST REPORT FOR CERTIFICATION  
On Behalf of

Hunan Greatwall Computer System Co.,Ltd

onn. 2-in-1 Convertible Laptop

Model Number: 100002434

FCC ID: 2APUQY1333W

Prepared for:	Hunan Greatwall Computer System Co.,Ltd
	Hu'nan Greatwall Industrial Park,Xiangyun Middle Rd.,Tianyuan Dist.
	Zhuzhou, Hu'nan,China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
	Tel: 86-769-83081888-808

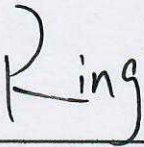
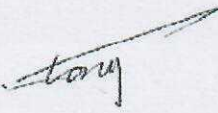

Report Number:	ESTE-R1907058
Date of Test:	Jun. 29~Aug. 12, 2019
Date of Report:	Aug. 13, 2019

## 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.....	6
2. SUMMARY OF TEST.....	7
2.1. Summary of test result.....	7
2.2. Test Facilities.....	8
2.3. Measurement uncertainty for EST Technology Co., Ltd.....	9
2.4. Assistant equipment used for test.....	9
2.5. Block Diagram.....	9
2.6. Test Mode.....	10
2.7. Channel List.....	12
2.8. Power Setting of Test Software.....	13
2.9. Duty Cycle of Test Signal.....	14
2.10. Test Equipment List.....	17
3. 6DB BANDWIDTH & 26DB BANDWIDTH & 99% OCCUPIED BANDWIDTH.....	19
3.1. Limit.....	19
3.2. Test Setup.....	19
3.3. Spectrum Analyzer Setting.....	19
3.4. Test Procedure.....	20
3.5. Test Result.....	21
3.6. Test Result.....	23
4. MAXIMUM CONDUCTED OUTPUT POWER.....	35
4.1. Limit.....	35
4.2. Test Setup.....	35
4.3. Test Procedure.....	35
4.4. Test Result.....	36
5. PEAK POWER SPECTRAL DENSITY.....	38
5.1. Limit.....	38
5.2. Test Setup.....	38
5.3. Spectrum Analyzer Setting.....	38
5.4. Test Procedure.....	38
5.5. Test Result.....	39
6. UNWANTED EMISSIONS AND BAND EDGE.....	49
6.1. Limit.....	49
6.2. Test Setup.....	50
6.3. Spectrum Analyzer Setting.....	51
6.4. Test Procedure.....	52
6.5. Test Result.....	53
7. FREQUENCY STABILITY.....	97
7.1. Limit.....	97
7.2. Test Setup.....	97
7.3. Spectrum Analyzer Setting.....	97
7.4. Test Procedure.....	98

- 7.5. Test Result..... 99
- 8. AC POWER LINE CONDUCTED EMISSIONS .....103
  - 8.1. Limit..... 103
  - 8.2. Test Setup..... 103
  - 8.3. Spectrum Analyzer Setting..... 103
  - 8.4. Test Procedure..... 103
  - 8.5. Test Result..... 104
- 9. ANTENNA REQUIREMENTS .....108
  - 9.1. Limit..... 108
  - 9.2. Test Result..... 108
- 10. TEST SETUP PHOTO.....109
- 11. PHOTO EUT.....112

### EST Technology Co., Ltd.

<b>Applicant:</b>	Hunan Greatwall Computer System Co.,Ltd		
<b>Address:</b>	Hu'nan Greatwall Industrial Park,Xiangyun Middle Rd., Tianyuan Dist. Zhuzhou, Hu'nan,China		
<b>Manufacturer:</b>	Hunan Greatwall Computer System Co.,Ltd		
<b>Address:</b>	Hu'nan Greatwall Industrial Park,Xiangyun Middle Rd., Tianyuan Dist. Zhuzhou, Hu'nan,China		
<b>E.U.T:</b>	onn. 2-in-1 Convertible Laptop		
<b>Model Number:</b>	100002434		
<b>Power Supply:</b>	DC 20V From Adapter Input AC100-240V~50/60Hz		
<b>Trade Name:</b>	ONN.	<b>Serial No.:</b>	-----
<b>Date of Receipt:</b>	Jun. 29, 2019	<b>Date of Test:</b>	Jun. 29~Aug. 12, 2019
<b>Test Specification:</b>	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		
<b>Test Result:</b>	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.  <p style="text-align: right;">Date: Aug 13, 2019</p>		
<b>Prepared by:</b>	<b>Reviewed by:</b>	<b>Approved by:</b>	
 _____ Ring / Assistant	 _____ Tony / Engineer	 _____ Iceman Hu / Manager	
<b>Other Aspects:</b>	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	:	2APUQY1333W
Product Name	:	onn. 2-in-1 Convertible Laptop
Model Number	:	100002434
Software Version	:	N/A
Hardware Version	:	N/A
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 150Mbps; IEEE 802.11ac: up to 433.3Mbps;
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: 11.718dBm IEEE 802.11n HT20: 11.666dBm IEEE 802.11n HT40: 11.819dBm IEEE 802.11ac VHT20: 11.670dBm IEEE 802.11ac VHT40: 11.807dBm IEEE 802.11ac VHT80: 11.581dBm
		U-NII-2A	IEEE 802.11a: 11.915dBm IEEE 802.11n HT20: 11.872dBm IEEE 802.11n HT40: 11.958dBm IEEE 802.11ac VHT20: 11.881dBm IEEE 802.11ac VHT40: 11.987dBm IEEE 802.11ac VHT80: 11.593dBm
		U-NII-2C	IEEE 802.11a: 11.178dBm IEEE 802.11n HT20: 11.117dBm IEEE 802.11n HT40: 11.621dBm IEEE 802.11ac VHT20: 11.109dBm IEEE 802.11ac VHT40: 11.611dBm IEEE 802.11ac VHT80: 11.552dBm
		U-NII-3	IEEE 802.11a: 11.575dBm IEEE 802.11n HT20: 11.466dBm IEEE 802.11n HT40: 11.869dBm IEEE 802.11ac VHT20: 11.439dBm IEEE 802.11ac VHT40: 11.809dBm IEEE 802.11ac VHT80: 11.562dBm
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	2.83

## 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	$7 \times 10^{-8}$
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.

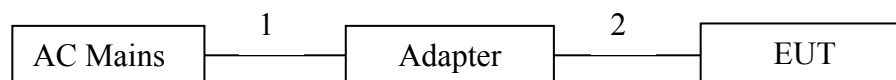
### 2.4. Assistant equipment used for test

Item	Equipment	Brand	Model Name/Type No.	FCC ID	Series No.
-	Adapter	BSY	BSY065T2003003 D		

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.5m	AC Cable
2	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.



AC 100-240V

(EUT: omn. 2-in-1 Convertible Laptop)

## 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	DRTU		
U-NII-1			
Frequency(MHz)	5180	5200	5240
IEEE 802.11a Setting	18	18	18
IEEE 802.11n HT20 Setting	18	18	18
IEEE 802.11ac VHT20 Setting			
Frequency(MHz)	5190	5230	
IEEE 802.11n HT40 Setting	18	18	
IEEE 802.11ac VHT40 Setting			
Frequency(MHz)	5210		
IEEE 802.11ac VHT80 Setting	18		
U-NII-2A			
Frequency(MHz)	5260	5300	5320
IEEE 802.11a Setting	18	18	18
IEEE 802.11n HT20 Setting	18	18	18
IEEE 802.11ac VHT20 Setting			
Frequency(MHz)	5270	5310	
IEEE 802.11n HT40 Setting	18	18	
IEEE 802.11ac VHT40 Setting			
Frequency(MHz)	5290		
IEEE 802.11ac VHT80 Setting	18		
U-NII-2C			
Frequency(MHz)	5500	5580	5700
IEEE 802.11a Setting	18	18	18
IEEE 802.11n HT20 Setting	18	18	18
IEEE 802.11ac VHT20 Setting			
Frequency(MHz)	5510	5670	
IEEE 802.11n HT40 Setting	18	18	
IEEE 802.11ac VHT40 Setting			
Frequency(MHz)	5530	5610	
IEEE 802.11ac VHT80 Setting	18	18	
U-NII-3			
Frequency(MHz)	5745	5785	5825
IEEE 802.11a Setting	18	18	18
IEEE 802.11n HT20 Setting	18	18	18
IEEE 802.11ac VHT20 Setting			
Frequency(MHz)	5755	5795	
IEEE 802.11n HT40 Setting	18	18	
IEEE 802.11ac VHT40 Setting			
Frequency(MHz)	5775		
IEEE 802.11ac VHT80 Setting	18		

## 2.9. Duty Cycle of Test Signal

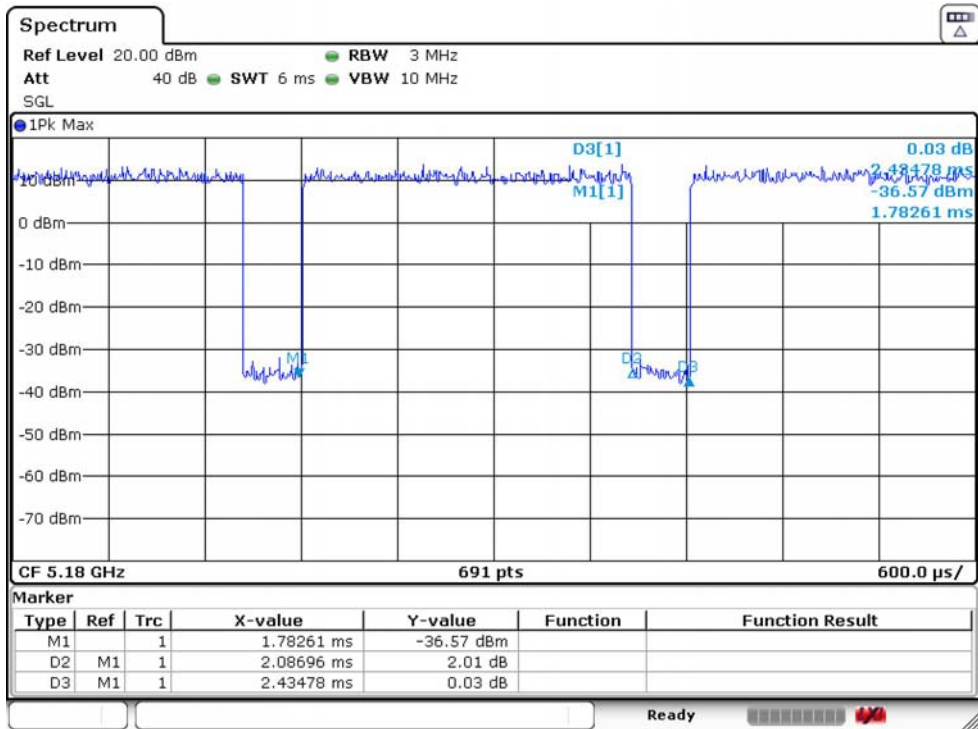
Temperature	25°C	Relative Humidity		55%	Test Voltage		120V/60Hz
Mode	Frequency (MHz)	On time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T (Hz)	VBW Setting (dB)
802.11a	5180	2.08696	2.43478	85.71	0.67	479	479
802.11n HT20	5180	1.93043	2.26087	85.38	0.69	518	518
802.11n HT40	5190	0.95652	1.11304	85.94	0.66	1045	1045
802.11ac VHT80	5210	0.47826	0.55652	85.94	0.66	2091	2091

Note:

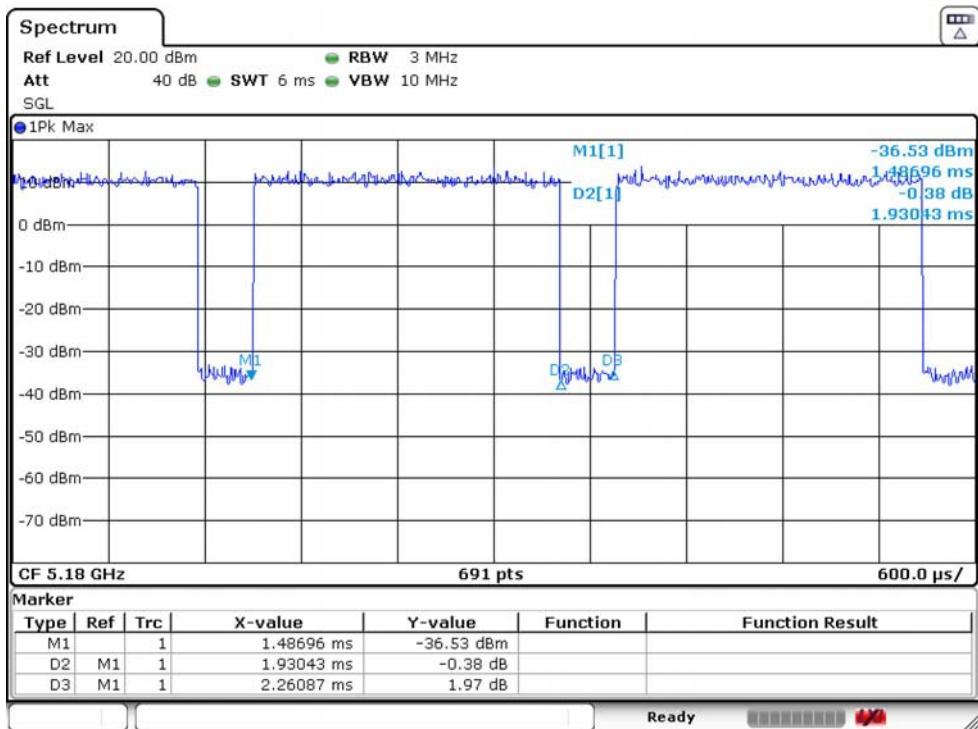
1. Duty Cycle=On Time/Total Time×100%.
2. Duty Factor=10×LOG(1/Duty Cycle).
3. If duty cycle <98 %, the conducted average output power and average power spectral density should be add duty factor.
4. If duty cycle ≥98 %,the EUT is consider to be transmitting continuously,the conducted average output 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.



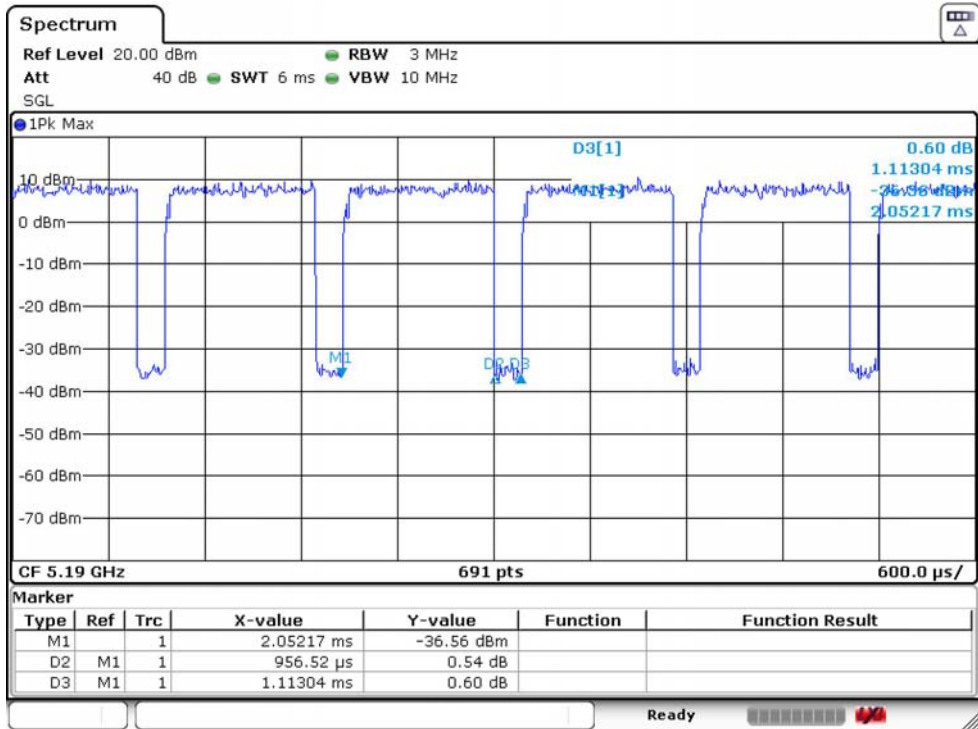
### 802.11a 5180MHz



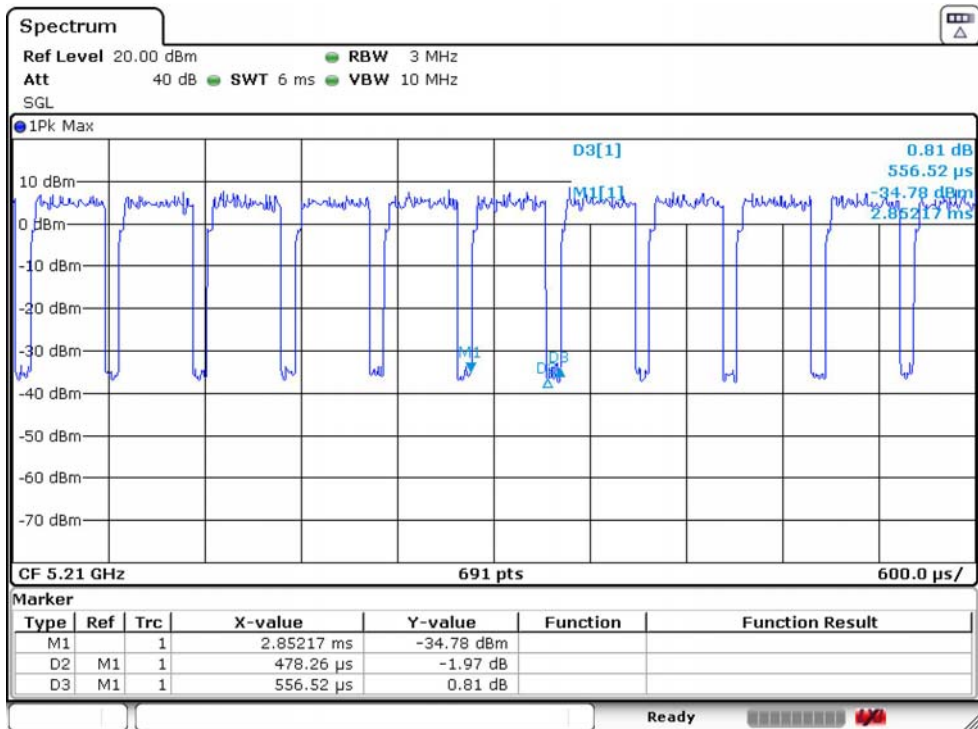
### 802.11n HT20 5180MHz



### 802.11n HT40 5190MHz



### 802.11ac 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	CEPREI	June 14,19	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	101260	CEPREI	June 14,19	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101100	CEPREI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

For radiated emissions test(9KHz-30MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	101780	CEPREI	June 14,19	1 Year
Active Loop Antenna	SCHWARZECK	FMZB 1519B	1519B-088	N/A	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
9kHz-30MHz Cable	N/A	EST-001	N/A	N/A	N/A	N/A

For radiated emissions test(30MHz-1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	101780	CEPREI	June 14,19	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	CEPREI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
30-1000MHz Cable	N/A	EST-002	N/A	N/A	N/A	N/A

For radiated emissions test(Above 1GHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZECK	BBHA 9120 D	BBHA9120D1002	CEPREI	June 14,19	1 Year
Horn Antenna	SCHWARZECK	BBHA9170	BBHA9170242	CEPREI	June 14,19	1 Year
Signal Amplifier	SCHWARZECK	BBV9718	9718-212	CEPREI	June 14,19	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSV	103173	CEPREI	June 14,19	1 Year
PSA Series Spectrum Analyzer	Agilent	E4447A	MY50180031	CEPREI	June 14,19	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
Above 1GHz Cable	N/A	EST-003	N/A	N/A	N/A	N/A

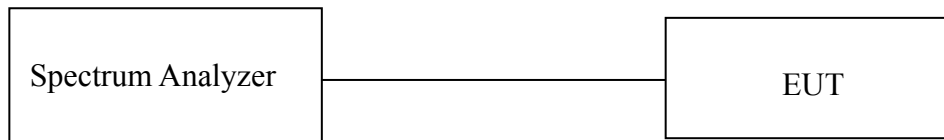
For connect EUT antenna terminal test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
TS 8997	Rohde &Schwarz	/	/	/	/	/
Open Switch and Control Unit	Rohde &Schwarz	OSP-B157WB	101309	CEPREI	June 14,19	1Year
Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	103173	CEPREI	June 14,19	1 Year
Signal Generator	Rohde &Schwarz	SMB100A	108752	CEPREI	June 14,19	1 Year
Vector Signal Generator	Rohde &Schwarz	SMBV100A	260753	CEPREI	June 14,19	1Year
Test Software	Rohde &Schwarz	WMS32	V10.40.00	N/A	N/A	N/A
Spectrum Analyzer	Agilent	E4408B	MY44211139	CEPREI	June 14,19	1 Year
Temperature controller	DK	DK70A	006562	Tiansu	June 14,19	1 Year
AC Source	CHANGJIAN NG	3KV	EST215-007	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

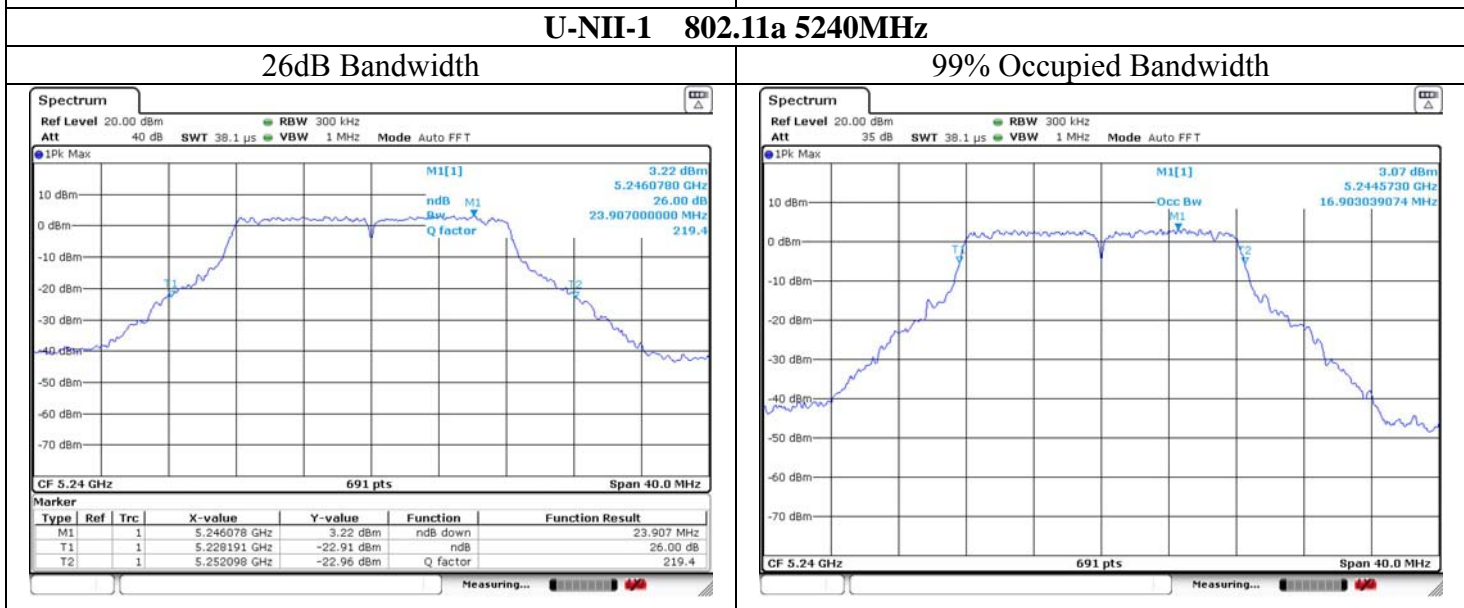
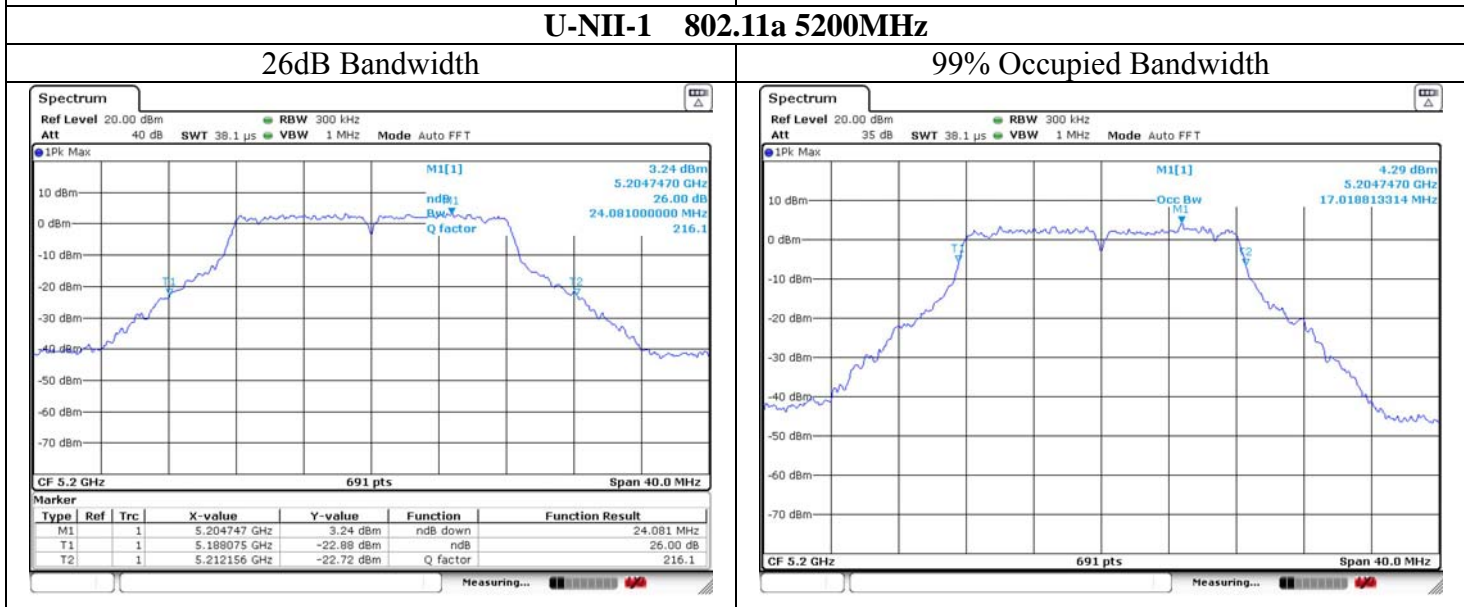
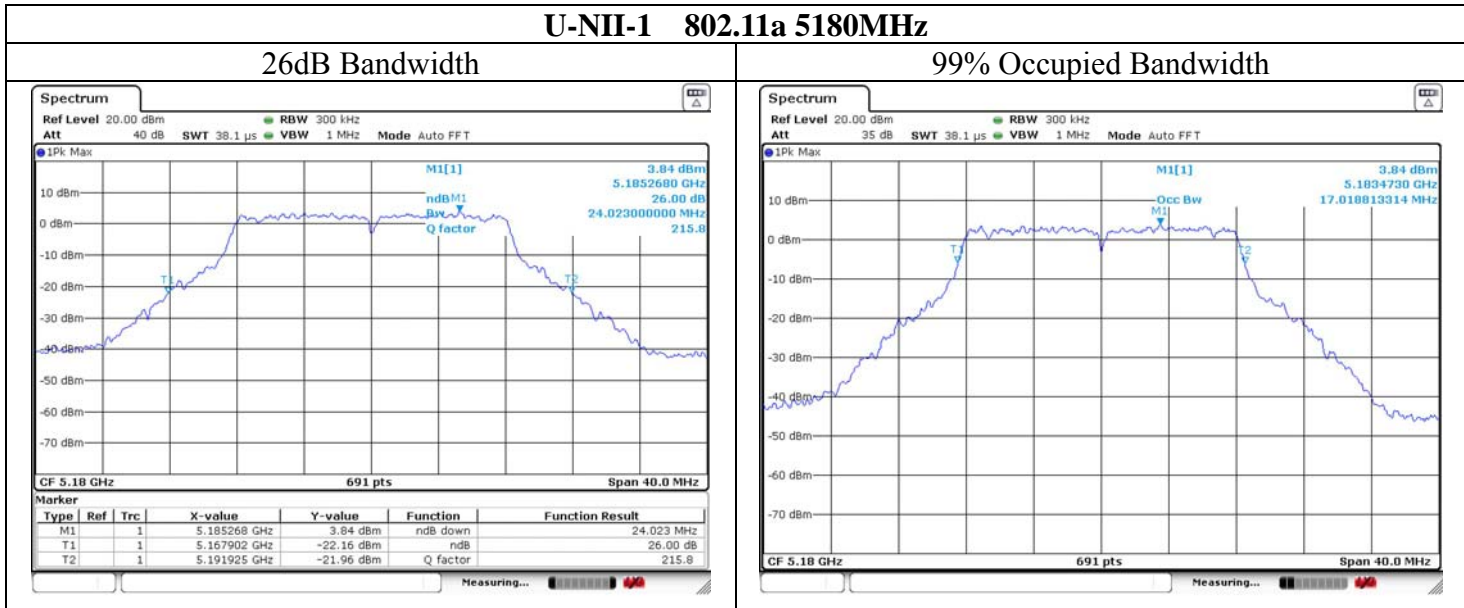
Temperature	25°C	Relative Humidity		55%	Test Voltage	120V/60Hz
26dB Bandwidth&99% Occupied Bandwidth						
BAND	Test Mode	Frequency (MHz)	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Calculate Power Limit (W)	Calculate Power Limit (dBm)
U-NII-1	802.11a	5180	24.023	17.019		
		5200	24.081	17.019		
		5240	23.907	16.903		
	802.11n HT20	5180	24.776	18.119		
		5200	24.255	18.061		
		5240	24.255	18.003		
	802.11ac VHT20	5180				
		5200				
		5240				
	802.11n HT40	5190	45.239	37.164		
		5230	44.978	37.048		
	802.11ac VHT40	5190				
5230						
802.11ac VHT80	5210	84.570	75.195			
U-NII-2A	802.11a	5260	23.444	16.903	23.444	16.903
		5300	23.792	16.961	23.792	16.961
		5320	23.386	16.961	23.386	16.961
	802.11n HT20	5260	23.792	18.003	23.792	18.003
		5300	24.139	18.119	24.139	18.119
		5320	24.370	18.003	24.370	18.003
	802.11ac VHT20	5260				
		5300				
		5320				
	802.11n HT40	5270	44.978	37.048	44.978	37.048
		5310	43.502	36.932	43.502	36.932
	802.11ac VHT40	5270				
5310						
802.11ac VHT80	5290	85.090	75.195	85.090	75.195	
U-NII-2C	802.11a	5500	24.776	17.019	24.776	17.019
		5580	24.313	16.961	24.313	16.961
		5700	24.139	16.961	24.139	16.961
	802.11n HT20	5500	24.139	18.119	24.139	18.119
		5580	23.560	18.119	23.560	18.119
		5700	24.081	18.061	24.081	18.061
	802.11ac VHT20	5500				
		5580				
		5700				
	802.11n HT40	5510	44.370	37.048	44.370	37.048
		5670	44.457	37.048	44.457	37.048
	802.11ac VHT40	5510				
5670						
802.11ac VHT80	5530	84.400	75.195	84.400	75.195	

Temperature	25°C	Relative Humidity	55%	Test Voltage	120V/60Hz	
6dB Bandwidth&99% Occupied Bandwidth						
BAND	Test Mode	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth ( MHz )	6dB BW Min Limit (MHz)	Result
U-NII-3	802.11a	5745	16.341	16.961	0.5	PASS
		5785	16.342	17.135	0.5	PASS
		5825	16.343	17.019	0.5	PASS
	802.11n HT20	5745	17.586	18.119	0.5	PASS
		5785	17.582	18.177	0.5	PASS
		5825	17.582	18.061	0.5	PASS
	802.11ac VHT20	5745				PASS
		5785				PASS
		5825				PASS
	802.11n HT40	5755	36.330	36.932	0.5	PASS
		5795	36.332	37.048	0.5	PASS
	802.11ac VHT40	5755				PASS
		5795				PASS
	802.11ac VHT80	5775	75.092	75.195	0.5	PASS

Note :

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

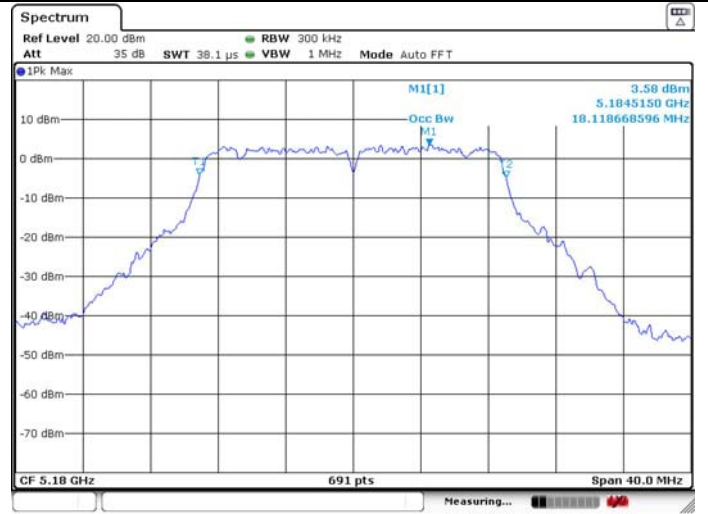
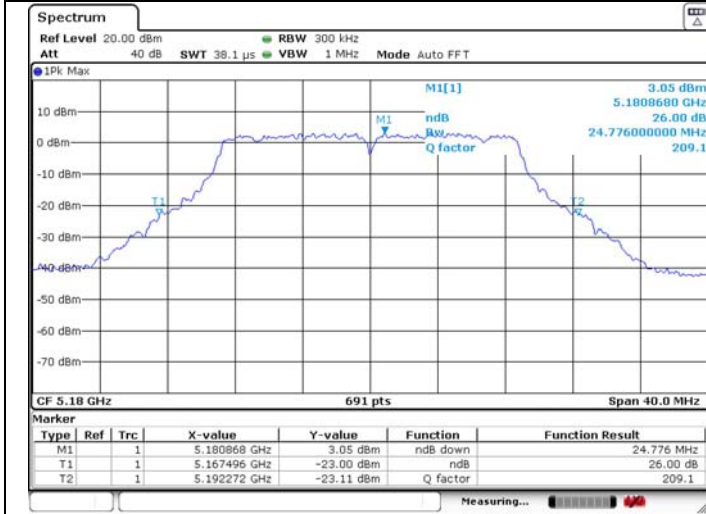
### 3.6. Test Result



**U-NII-1 802.11n HT20 5180MHz**

26dB Bandwidth

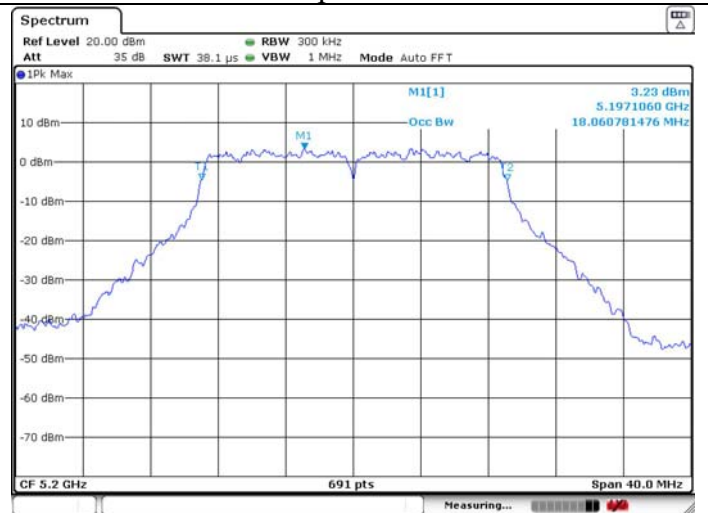
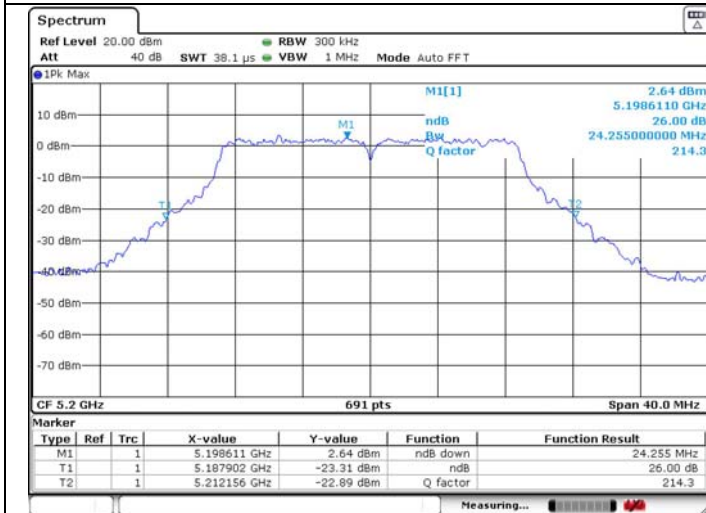
99% Occupied Bandwidth



**U-NII-1 802.11n HT20 5200MHz**

26dB Bandwidth

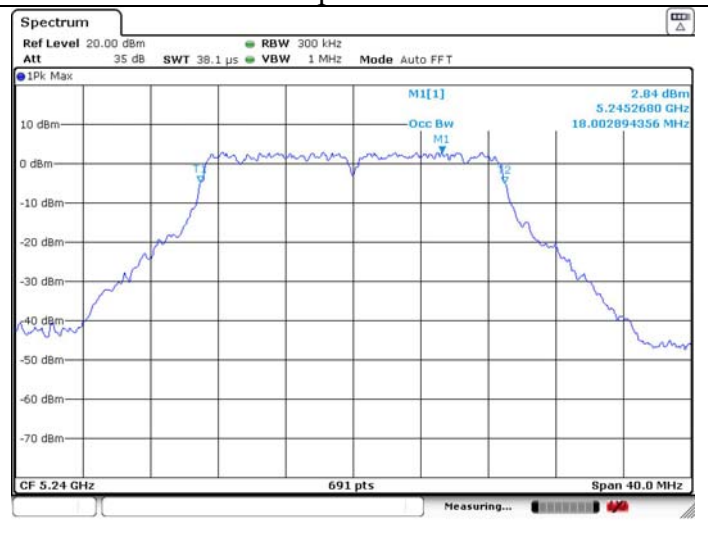
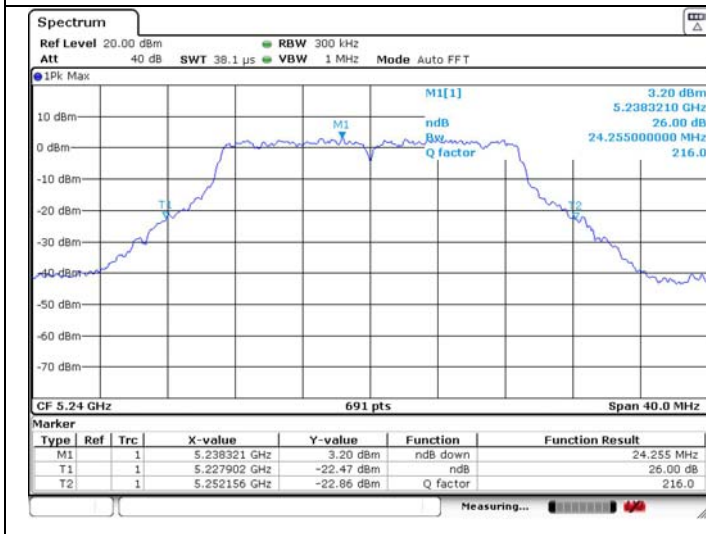
99% Occupied Bandwidth



**U-NII-1 802.11n HT20 5240MHz**

26dB Bandwidth

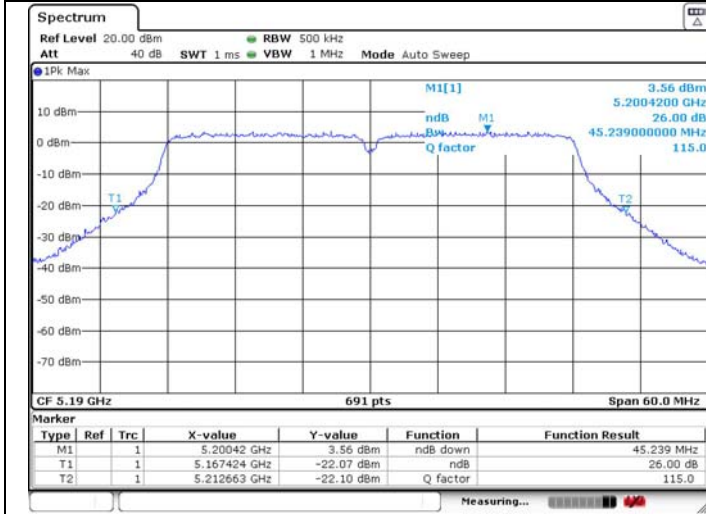
99% Occupied Bandwidth



**U-NII-1 802.11n HT40 5190MHz**

26dB Bandwidth

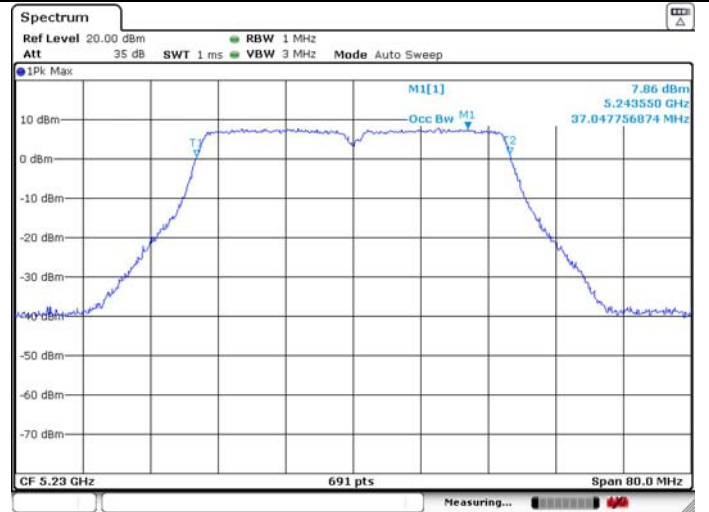
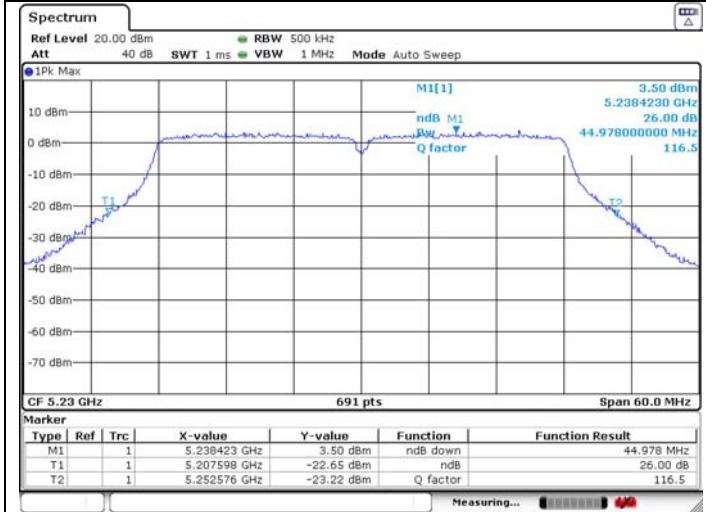
99% Occupied Bandwidth



**U-NII-1 802.11n HT40 5230MHz**

26dB Bandwidth

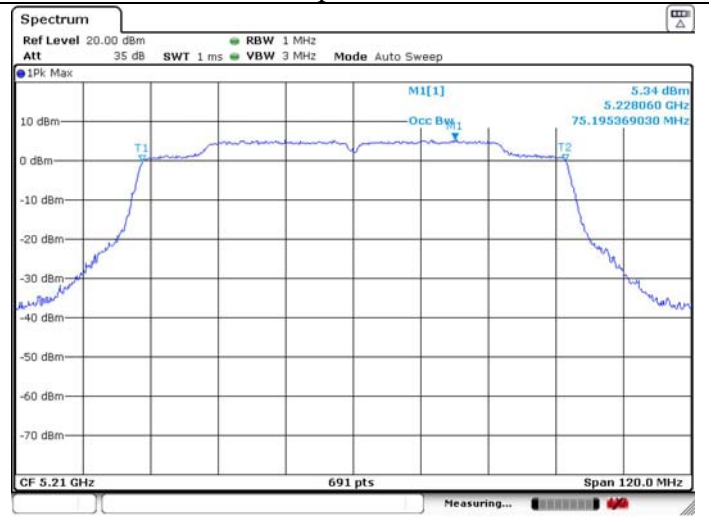
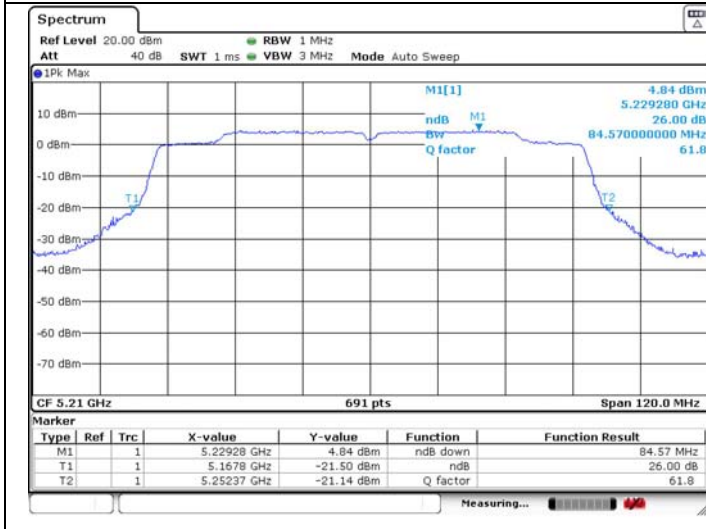
99% Occupied Bandwidth



**U-NII-1 802.11ac VHT80 5210MHz**

26dB Bandwidth

99% Occupied Bandwidth

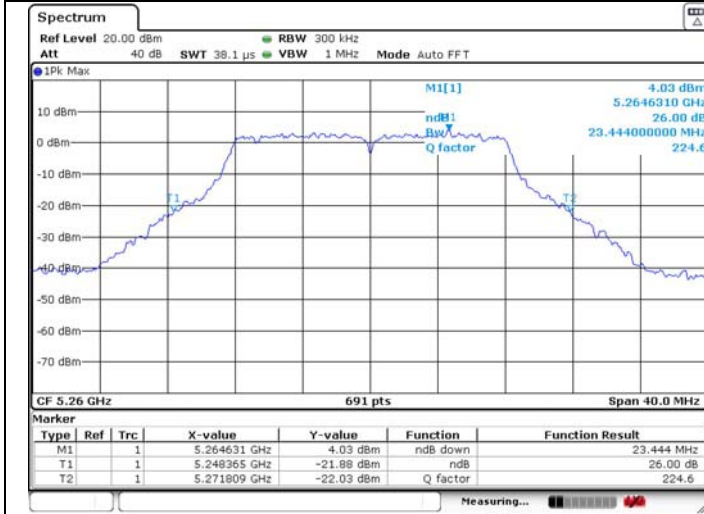




**U-NII-2A 802.11a 5260MHz**

26dB Bandwidth

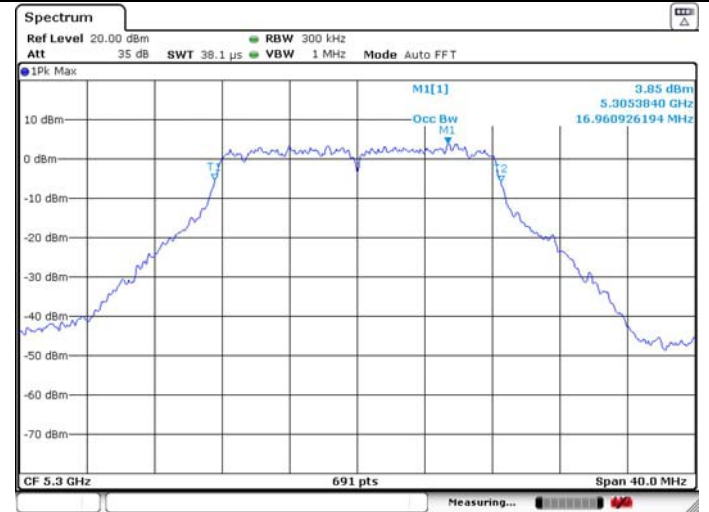
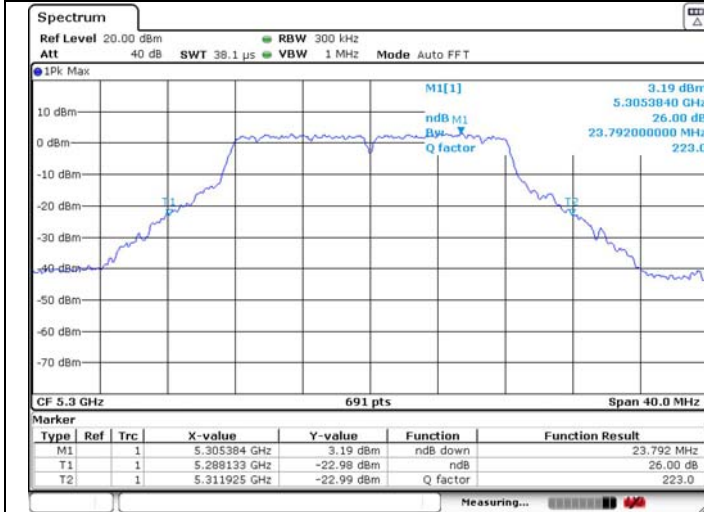
99% Occupied Bandwidth



**U-NII-2A 802.11a 5300MHz**

26dB Bandwidth

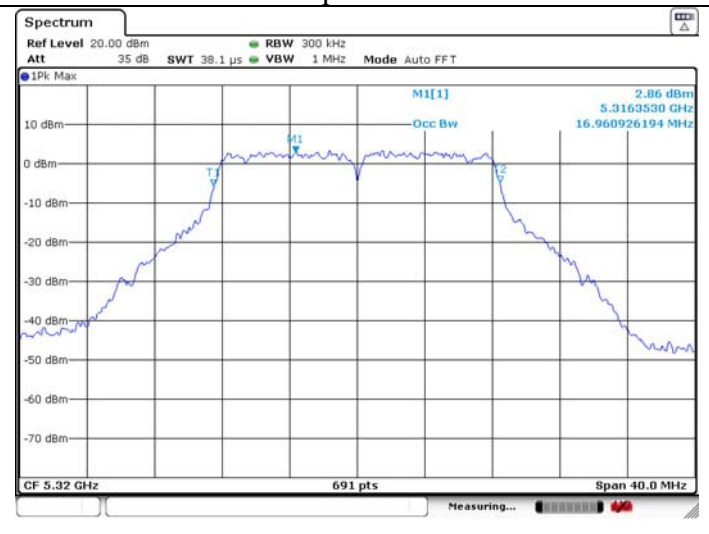
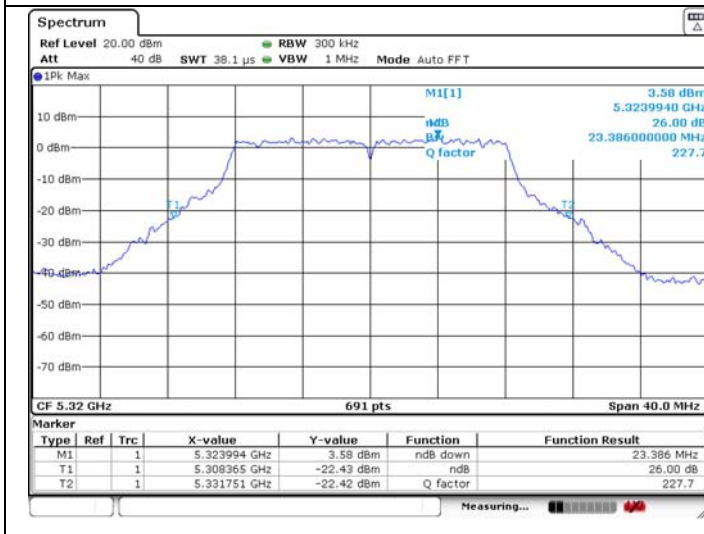
99% Occupied Bandwidth



**U-NII-2A 802.11a 5320MHz**

26dB Bandwidth

99% Occupied Bandwidth

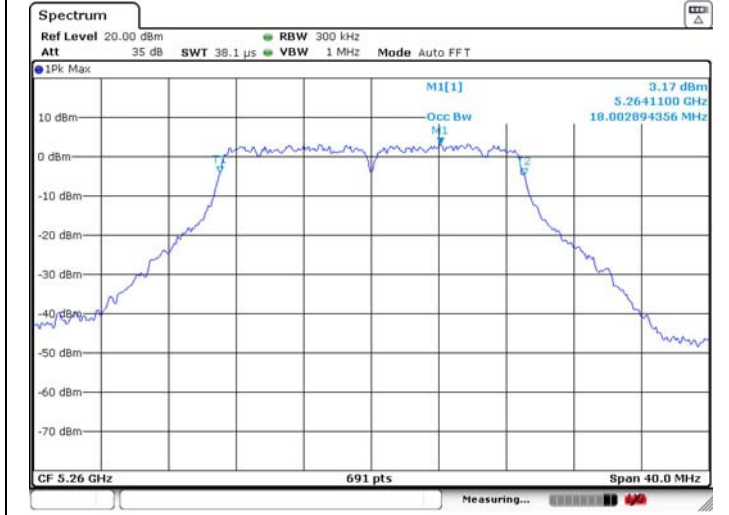
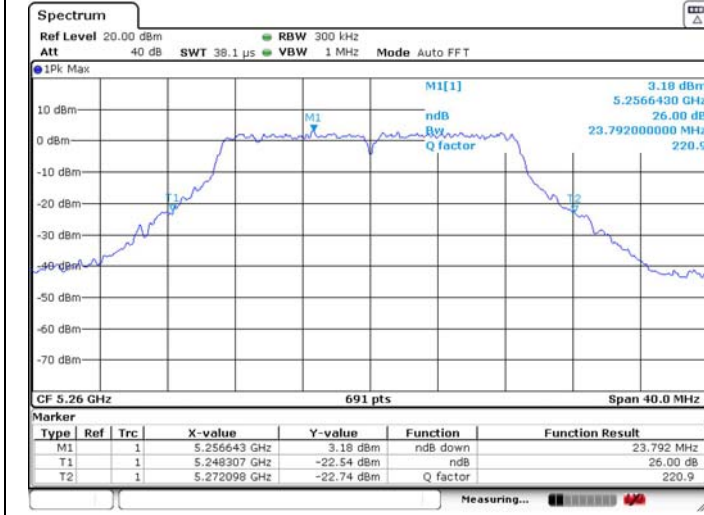




**U-NII-2A 802.11n HT20 5260MHz**

26dB Bandwidth

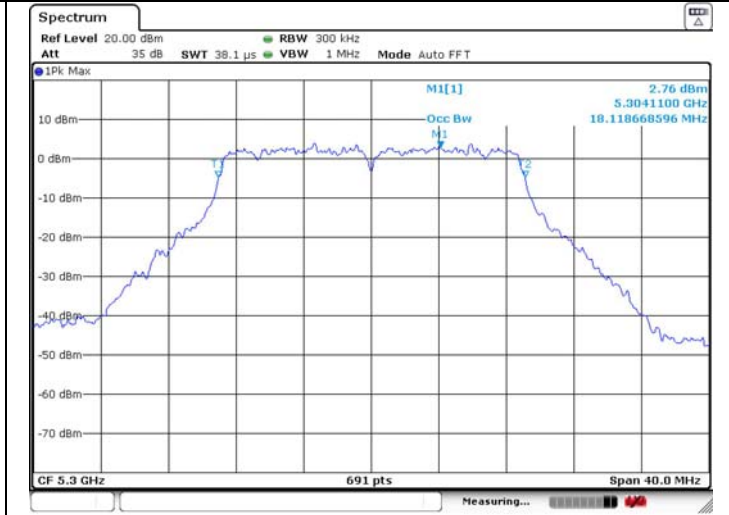
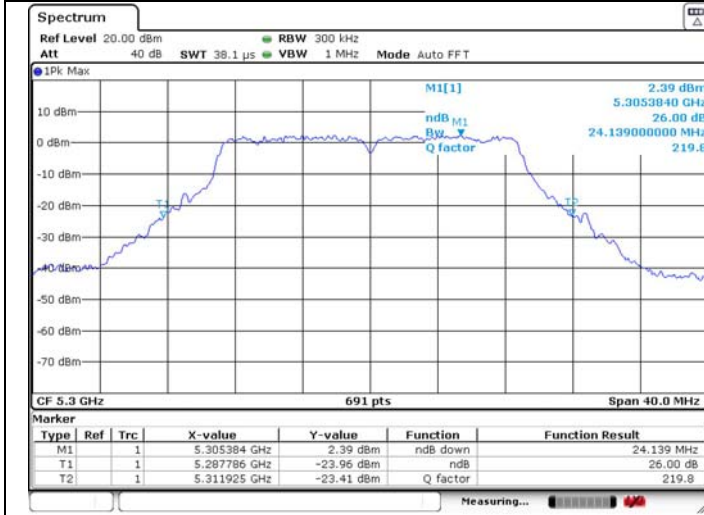
99% Occupied Bandwidth



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

26dB Bandwidth

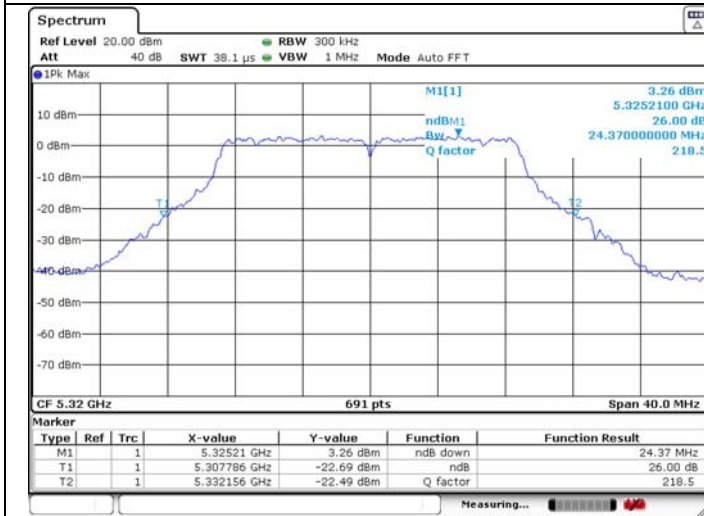
99% Occupied Bandwidth



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

26dB Bandwidth

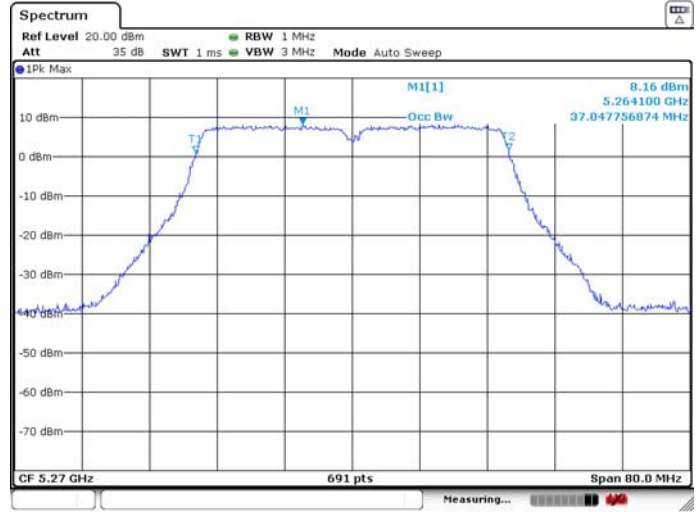
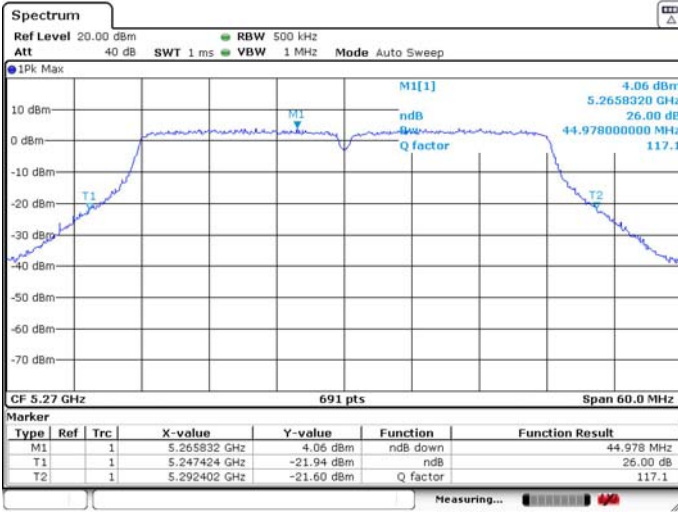
99% Occupied Bandwidth



U-NII-2A 802.11n HT40 5270MHz

26dB Bandwidth

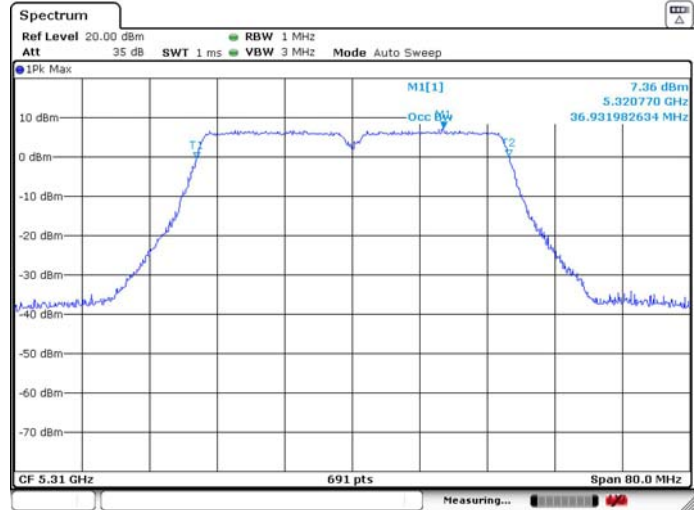
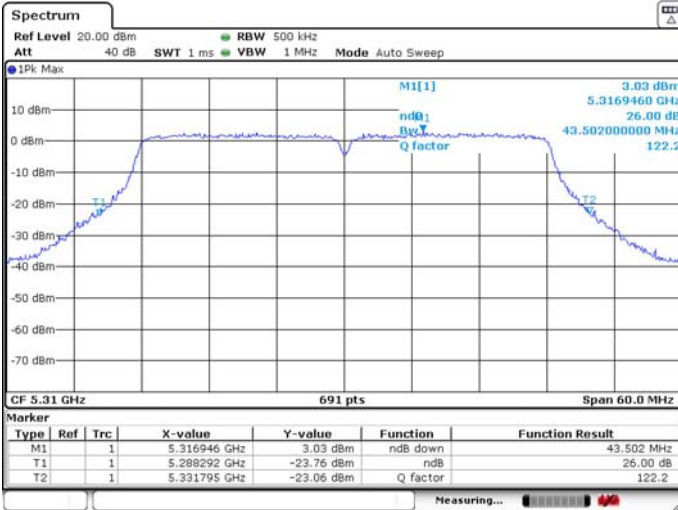
99% Occupied Bandwidth



U-NII-2A 802.11n HT40 5310MHz

26dB Bandwidth

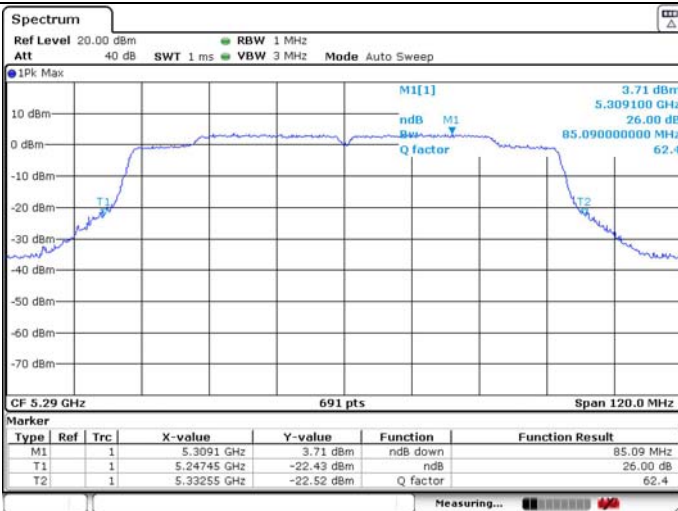
99% Occupied Bandwidth



U-NII-2A 802.11ac VHT80 5290MHz

26dB Bandwidth

99% Occupied Bandwidth

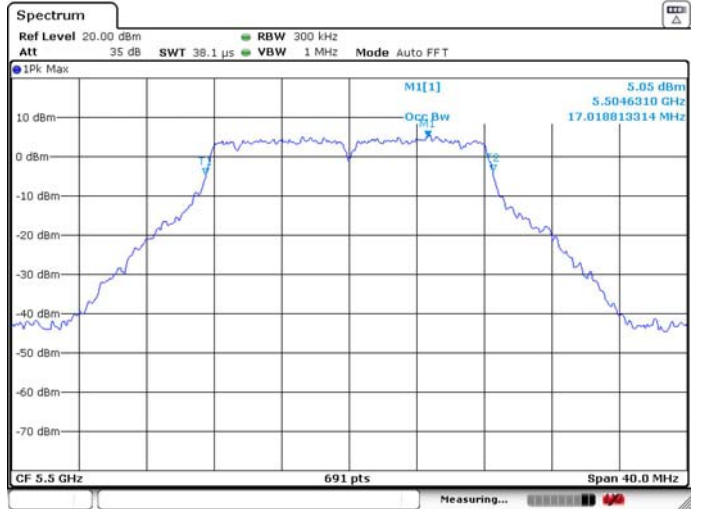


**U-NII-2C 802.11a 5500MHz**

26dB Bandwidth

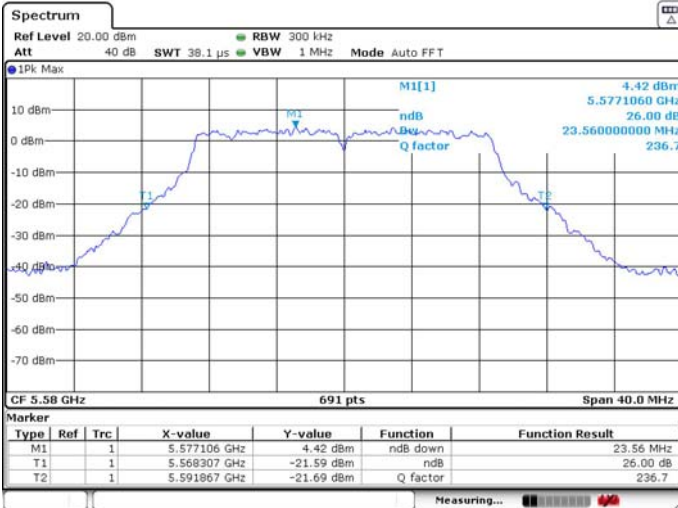


99% Occupied Bandwidth



**U-NII-2C 802.11a 5580MHz**

26dB Bandwidth

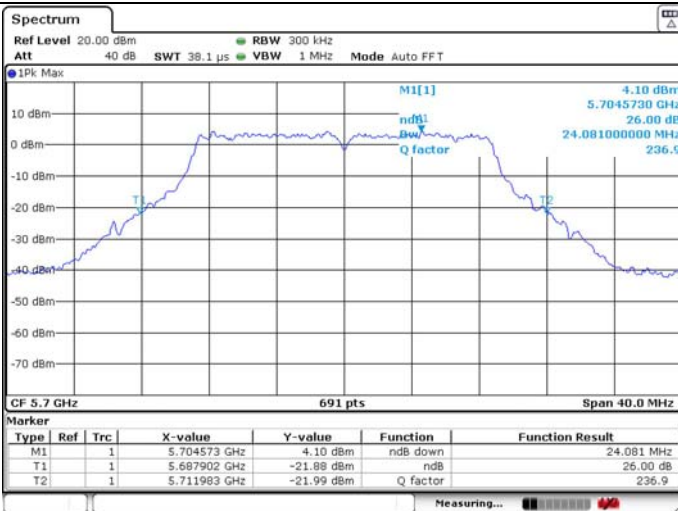


99% Occupied Bandwidth



**U-NII-2C 802.11a 5700MHz**

26dB Bandwidth



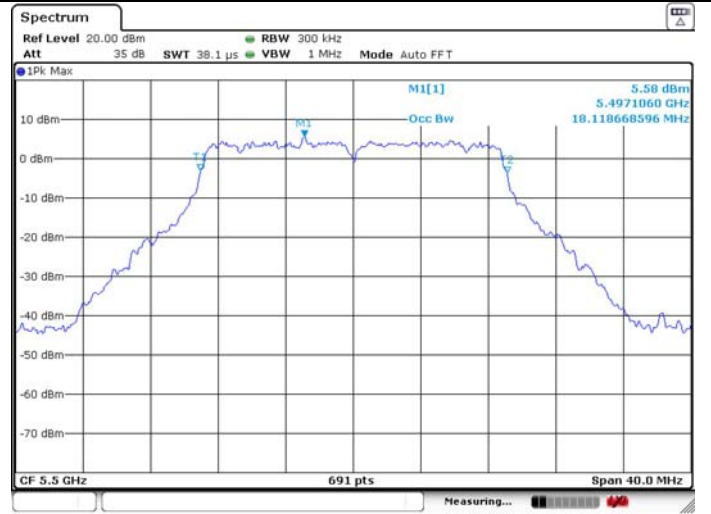
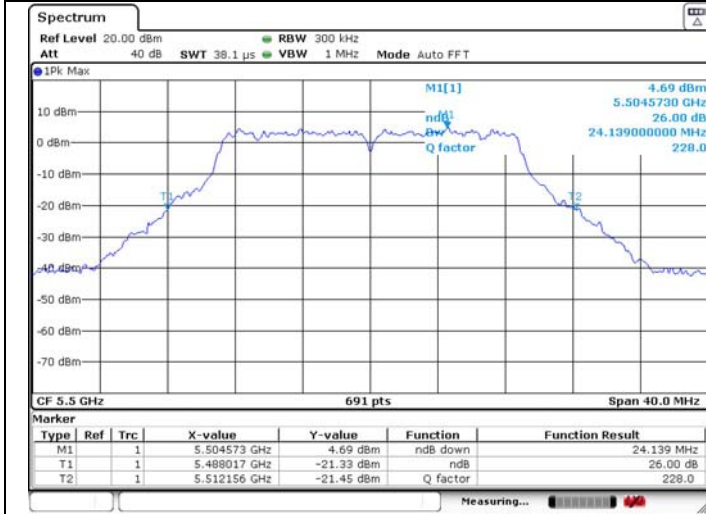
99% Occupied Bandwidth



U-NII-2C 802.11n HT20 5500MHz

26dB Bandwidth

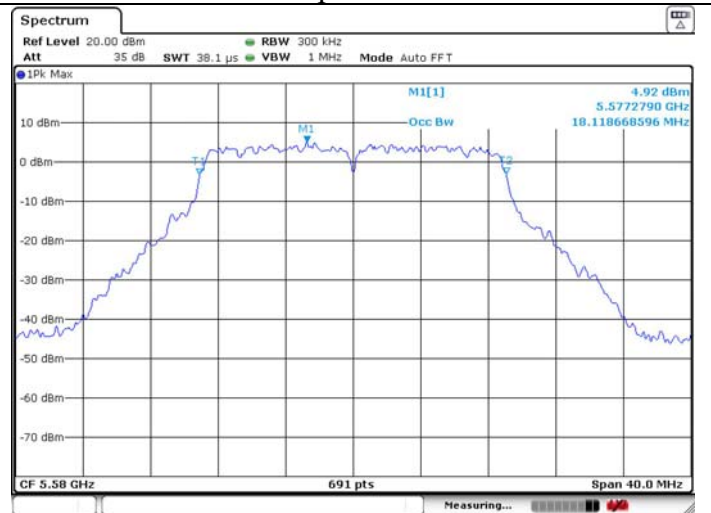
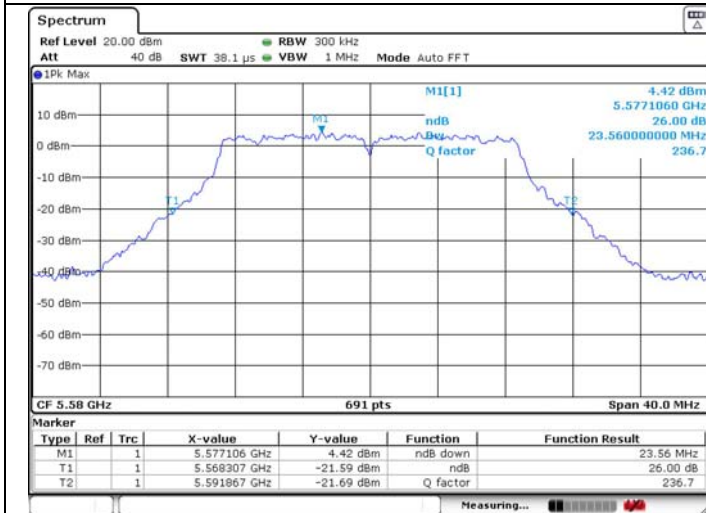
99% Occupied Bandwidth



U-NII-2C 802.11n HT20 5580MHz

26dB Bandwidth

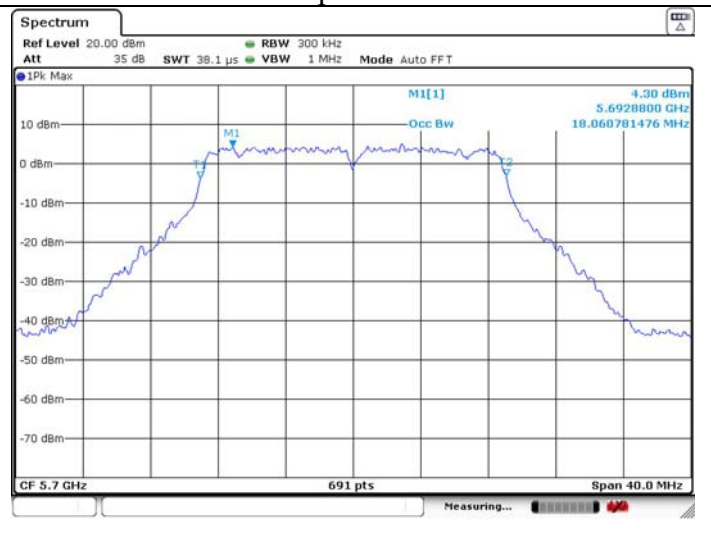
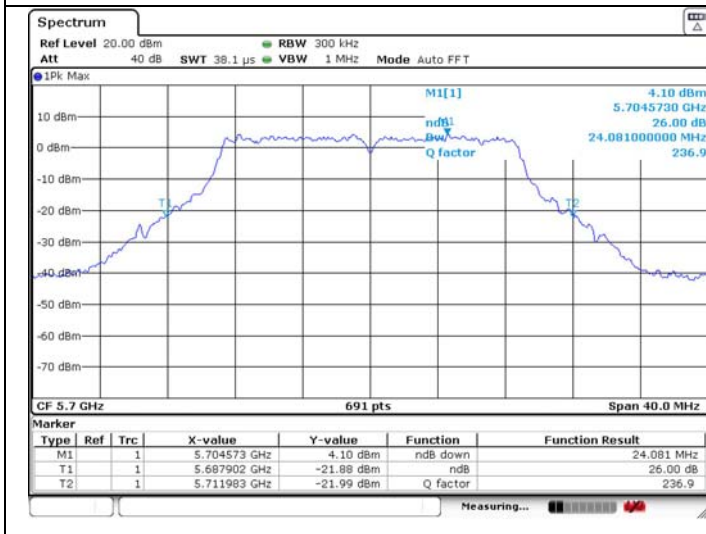
99% Occupied Bandwidth



U-NII-2C 802.11n HT20 5700MHz

26dB Bandwidth

99% Occupied Bandwidth

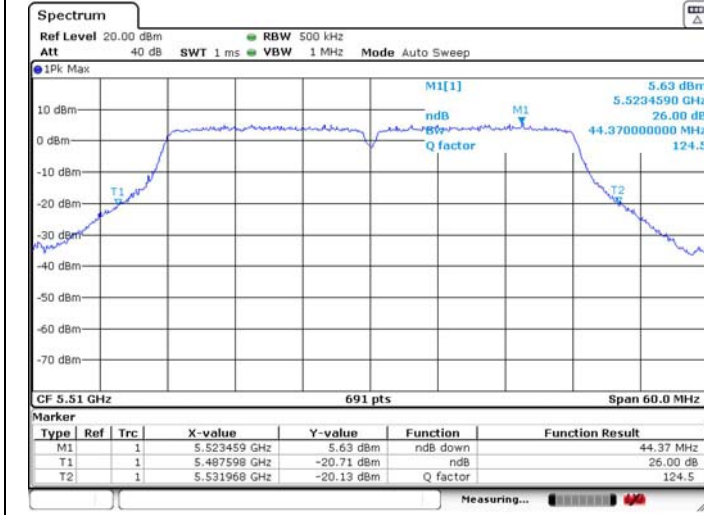




**U-NII-2C 802.11n HT40 5510MHz**

26dB Bandwidth

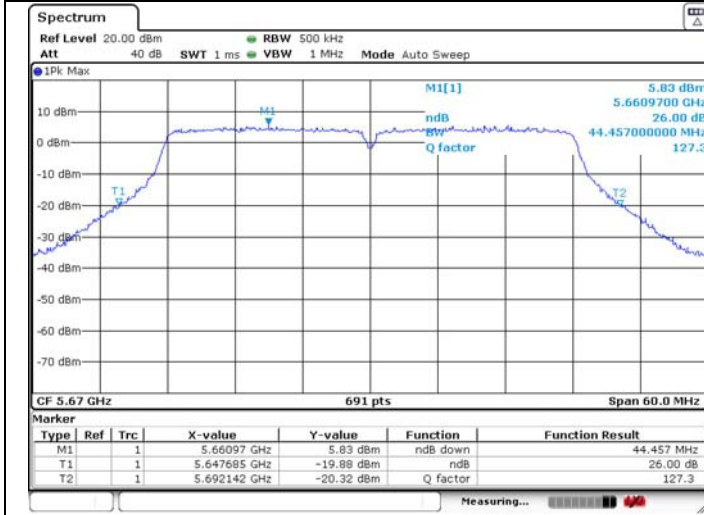
99% Occupied Bandwidth



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

26dB Bandwidth

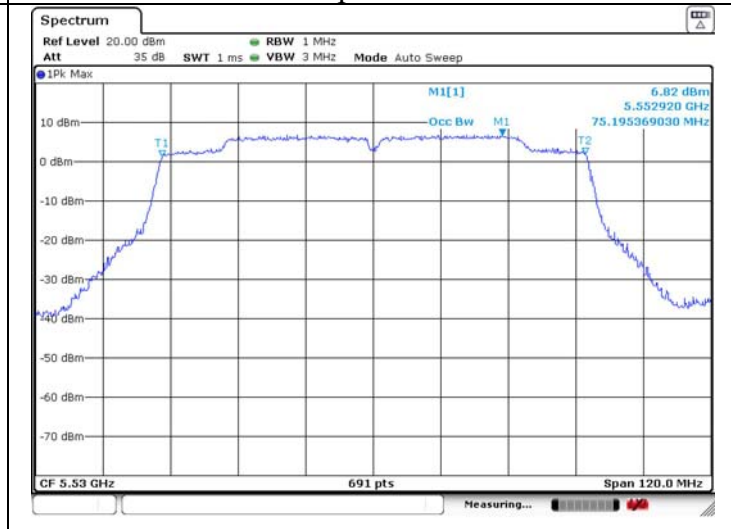
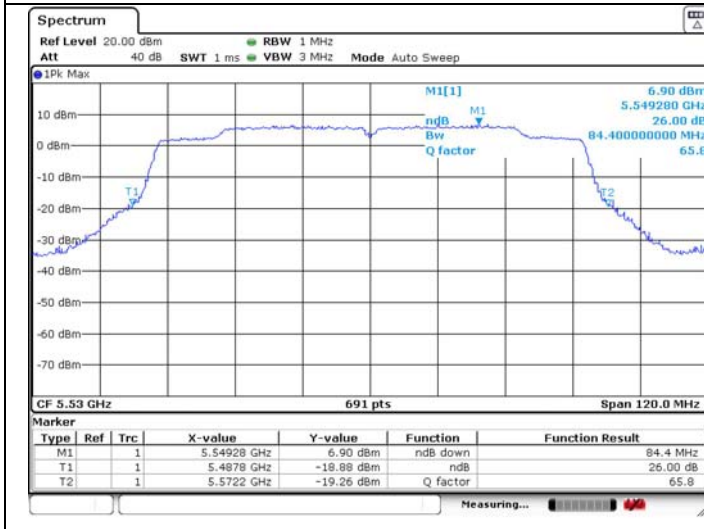
99% Occupied Bandwidth



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

26dB Bandwidth

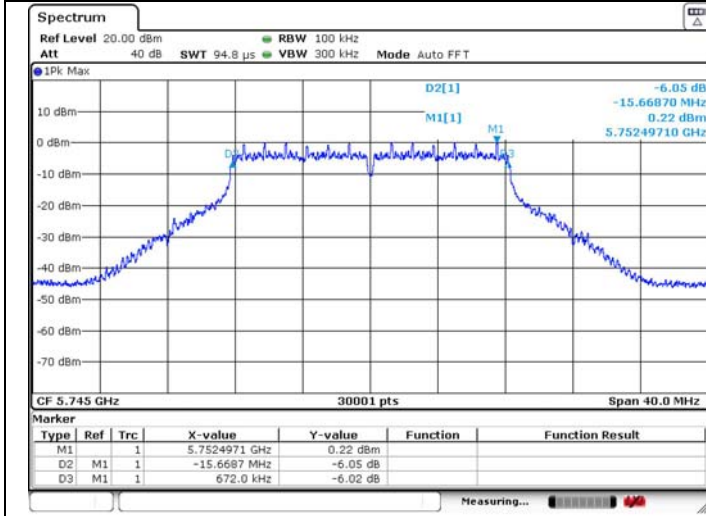
99% Occupied Bandwidth



U-NII-3 802.11a 5745MHz

6dB Bandwidth

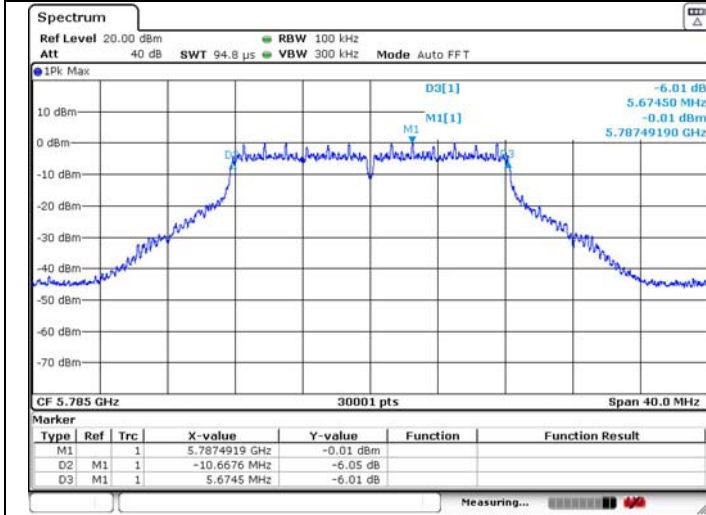
99% Occupied Bandwidth



U-NII-3 802.11a 5785MHz

6dB Bandwidth

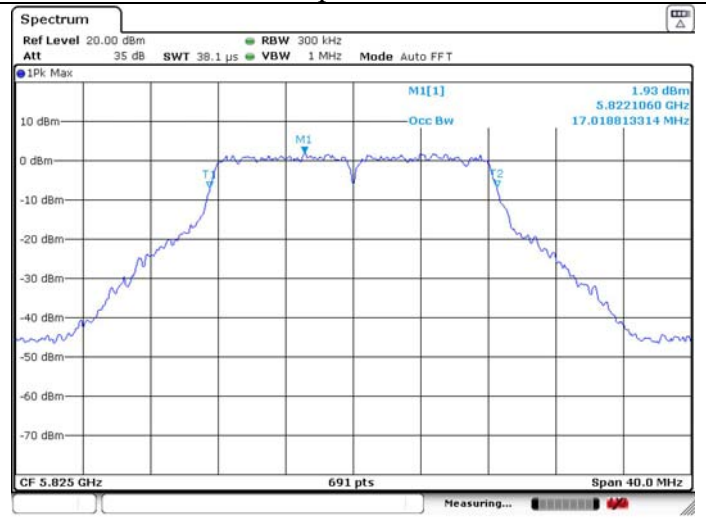
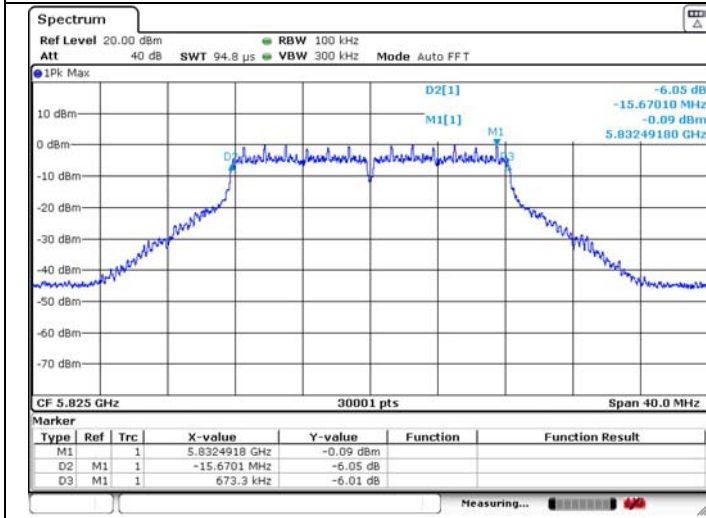
99% Occupied Bandwidth



U-NII-3 802.11a 5825MHz

6dB Bandwidth

99% Occupied Bandwidth

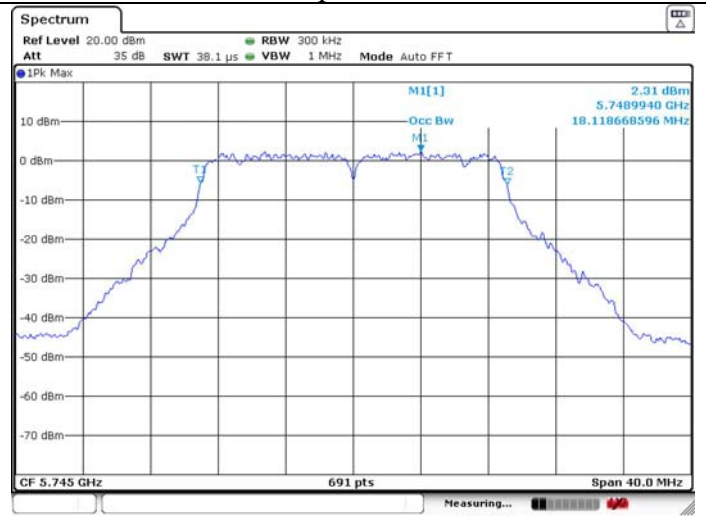
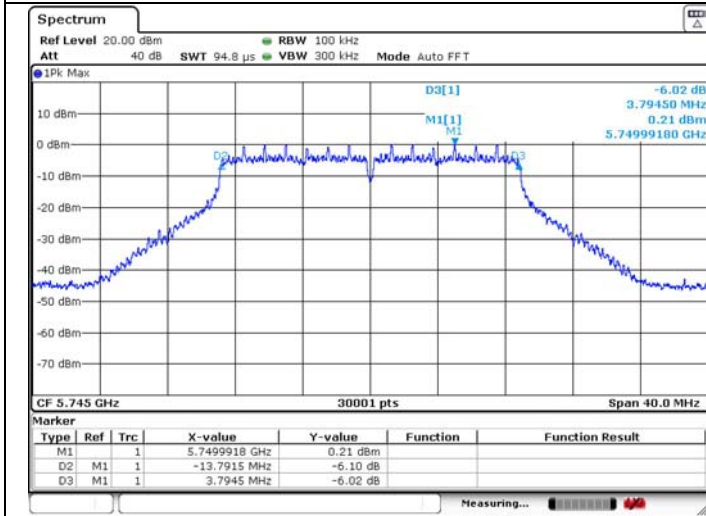




**U-NII-3 802.11n HT20 5745MHz**

6dB Bandwidth

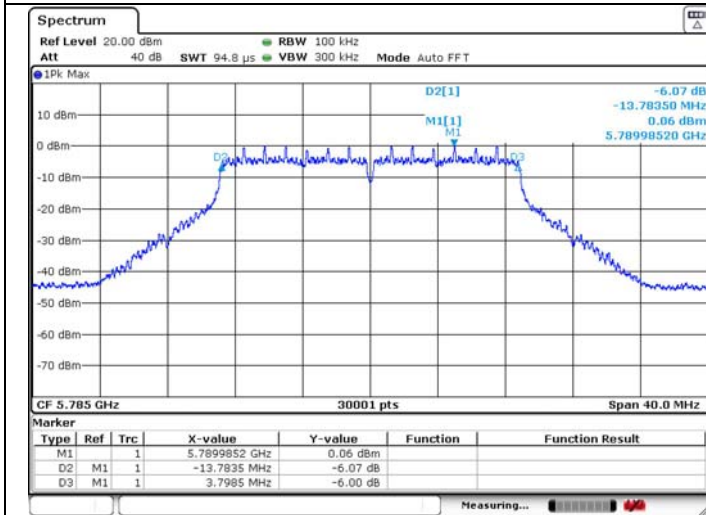
99% Occupied Bandwidth



**U-NII-3 802.11n HT20 5785MHz**

6dB Bandwidth

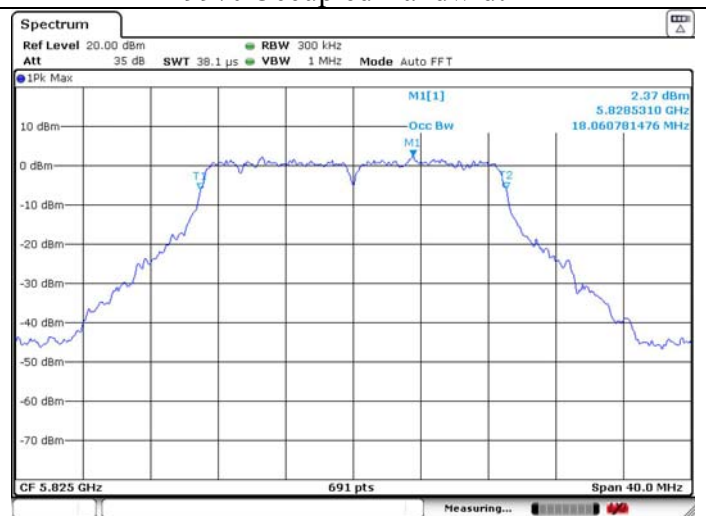
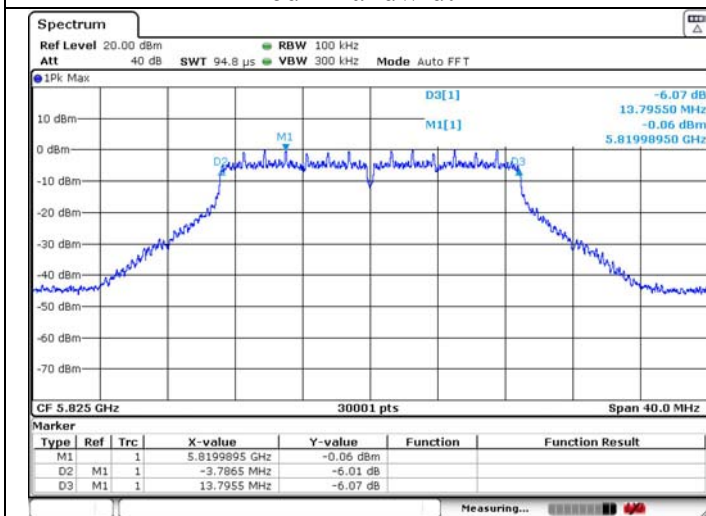
99% Occupied Bandwidth



**U-NII-3 802.11n HT20 5825MHz**

6dB Bandwidth

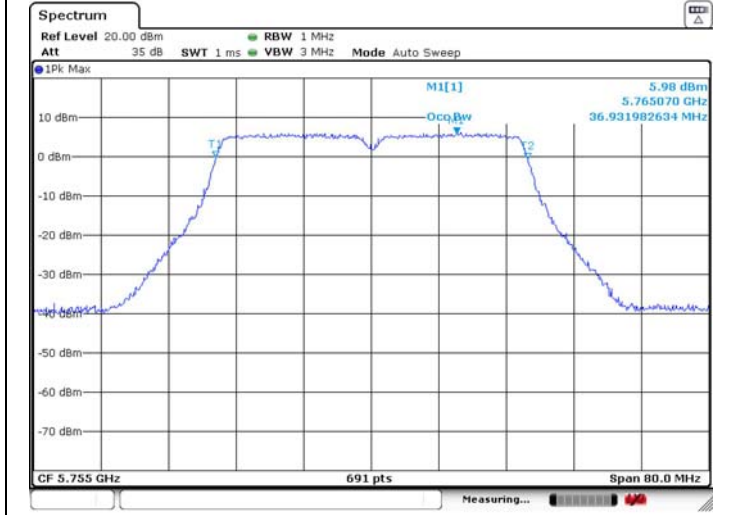
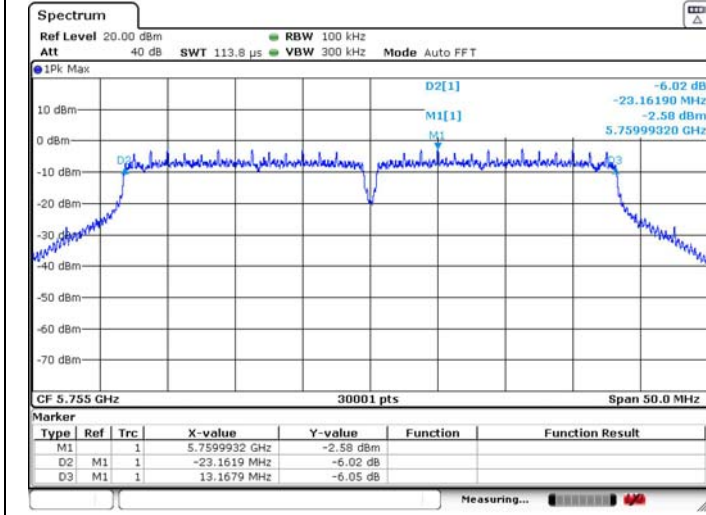
99% Occupied Bandwidth



**U-NII-3 802.11n HT40 5755MHz**

6dB Bandwidth

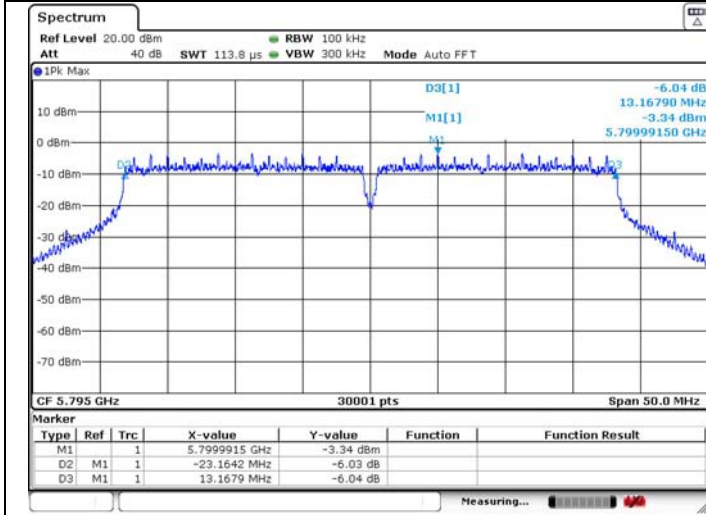
99% Occupied Bandwidth



**U-NII-3 802.11n HT40 5795MHz**

6dB Bandwidth

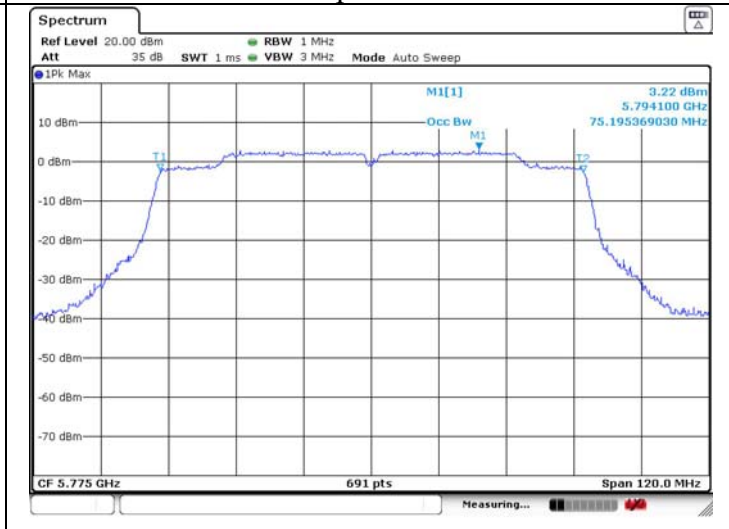
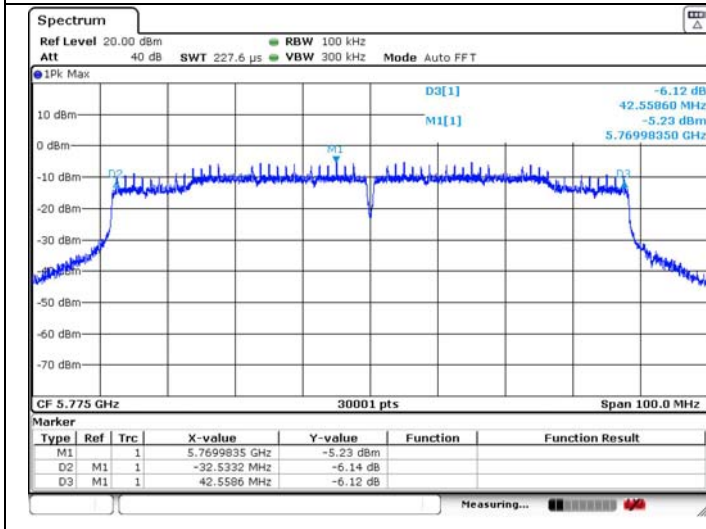
99% Occupied Bandwidth



**U-NII-3 802.11ac VHT80 5775MHz**

6dB Bandwidth

99% Occupied Bandwidth



## 4. MAXIMUM CONDUCTED OUTPUT POWER

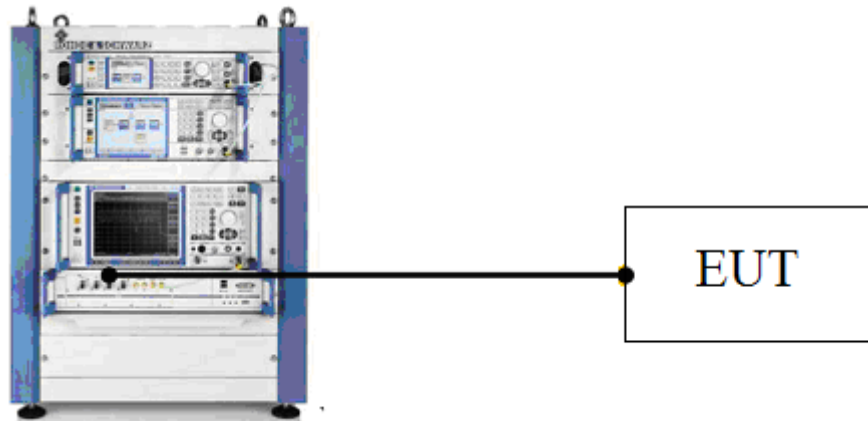
### 4.1. Limit

Band	EUT Type	Limit
U-NII-1	Outdoor Access Point	1W(30dBm) (Max. e.i.r.p $\leq$ 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

- Connect EUT antenna terminal to the OSP-B157WB with RF cable.
- Set the EUT transmit continuously with maximum output power.
- Through the test software in TS 8897 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.
- Repeat above procedures until all modes and channels were measured.
- Record the results in the test report.

4.4. Test Result

Temperature	25°C	Relative Humidity		55%	Test Voltage	120V/60Hz	
BAND	Test Mode	Frequency (MHz)	Conducted AVG Output Power (dBm)	Conducted AVG Output Power (W)	Limit (dBm)	Result	
U-NII-1	802.11a	5180	11.434	0.0139	23.98	PASS	
		5200	11.470	0.0140	23.98	PASS	
		5240	11.718	0.0149	23.98	PASS	
	802.11n HT20	5180	11.344	0.0136	23.98	PASS	
		5200	11.445	0.0139	23.98	PASS	
		5240	11.666	0.0147	23.98	PASS	
	802.11ac VHT20	5180					
		5200					
		5240					
	802.11n HT40	5190	11.612	0.0145	23.98	PASS	
		5230	11.819	0.0152	23.98	PASS	
	802.11ac VHT40	5190					
		5230					
	802.11ac VHT80	5210	11.581	0.0144	23.98	PASS	
U-NII-2A	802.11a	5260	11.538	0.0142	23.98	PASS	
		5300	11.712	0.0148	23.98	PASS	
		5320	11.915	0.0155	23.98	PASS	
	802.11n HT20	5260	11.463	0.0140	23.98	PASS	
		5300	11.689	0.0148	23.98	PASS	
		5320	11.873	0.0154	23.98	PASS	
	802.11ac VHT20	5260					
		5300					
		5320					
	802.11n HT40	5270	11.653	0.0146	23.98	PASS	
		5310	11.958	0.0157	23.98	PASS	
	802.11ac VHT40	5270					
		5310					
	802.11ac VHT80	5290	11.593	0.0144	23.98	PASS	

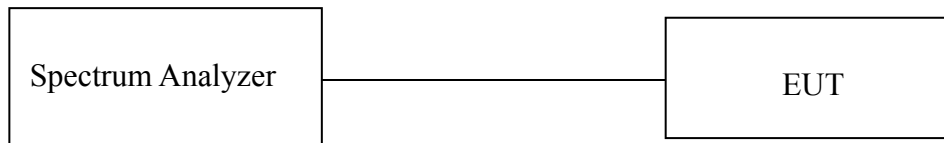
BAND	Test Mode	Frequency (MHz)	Conducted AVG Output Power (dBm)	Conducted AVG Output Power (W)	Limit (dBm)	Result
U-NII-2C	802.11a	5500	11.113	0.0129	23.98	PASS
		5580	11.178	0.0131	23.98	PASS
		5700	10.929	0.0124	23.98	PASS
	802.11n HT20	5500	11.083	0.0128	23.98	PASS
		5580	11.117	0.0129	23.98	PASS
		5700	10.892	0.0123	23.98	PASS
	802.11ac VHT20	5500				
		5580				
		5700				
	802.11n HT40	5510	11.436	0.0139	23.98	PASS
		5670	11.621	0.0145	23.98	PASS
	802.11ac VHT40	5510				
		5670				
802.11ac VHT80	5530	11.552	0.0143	23.98	PASS	
U-NII-3	802.11a	5745	11.575	0.0144	30.00	PASS
		5785	11.336	0.0136	30.00	PASS
		5825	11.134	0.0130	30.00	PASS
	802.11n HT20	5745	11.466	0.0140	30.00	PASS
		5785	11.288	0.0135	30.00	PASS
		5825	11.038	0.0127	30.00	PASS
	802.11ac VHT20	5745				
		5785				
		5825				
	802.11n HT40	5755	11.869	0.0154	30.00	PASS
		5795	11.388	0.0138	30.00	PASS
	802.11ac VHT40	5755				
		5795				
802.11ac VHT80	5775	11.562	0.0143	30.00	PASS	

## 5. PEAK POWER SPECTRAL DENSITY

### 5.1. Limit

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

### 5.2. Test Setup



### 5.3. Spectrum Analyzer Setting

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

### 5.4. Test Procedure

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



5.5. Test Result

Temperature		25°C	Relative Humidity		55%	Test Voltage	120V/60Hz	
BAND	Test Mode	Fre (MHz)	Power Density (dBm/MHz)	Duty Factor (dB)	Total Power Density (dBm/MHz)	Limit (dBm/MHz)	Result	
U-NII-1	802.11a	5180	9.35	0.67	10.02	11.00	PASS	
		5200	9.40	0.67	10.07	11.00	PASS	
		5240	9.14	0.67	9.81	11.00	PASS	
	802.11n HT20	5180	10.11	0.69	10.80	11.00	PASS	
		5200	9.99	0.69	10.68	11.00	PASS	
		5240	9.86	0.69	10.55	11.00	PASS	
	802.11ac VHT20	5180						
		5200						
		5240						
	802.11n HT40	5190	8.55	0.66	9.21	11.00	PASS	
		5230	7.64	0.66	8.30	11.00	PASS	
	802.11ac VHT40	5190						
5230								
802.11ac VHT80	5210	5.26	0.66	5.92	11.00	PASS		
U-NII-2A	802.11a	5260	9.22	0.67	9.89	11.00	PASS	
		5300	9.47	0.67	10.14	11.00	PASS	
		5320	9.36	0.67	10.03	11.00	PASS	
	802.11n HT20	5260	10.04	0.69	10.73	11.00	PASS	
		5300	9.79	0.69	10.48	11.00	PASS	
		5320	10.09	0.69	10.78	11.00	PASS	
	802.11ac VHT20	5260						
		5300						
		5320						
	802.11n HT40	5270	7.54	0.66	8.20	11.00	PASS	
		5310	7.69	0.66	8.35	11.00	PASS	
	802.11ac VHT40	5270						
5310								
802.11ac VHT80	5290	4.53	0.66	5.19	11.00	PASS		
U-NII-3	IEEE 802.11a	5500	9.30	0.67	9.97	11.00	PASS	
		5580	9.30	0.67	9.97	11.00	PASS	
		5700	9.13	0.67	9.80	11.00	PASS	
	IEEE 802.11n HT20	5500	9.70	0.69	10.39	11.00	PASS	
		5580	9.91	0.69	10.60	11.00	PASS	
		5700	9.75	0.69	10.44	11.00	PASS	
	IEEE 802.11ac VHT20	5500						
		5580						
		5700						
	IEEE 802.11n HT40	5510	7.56	0.66	8.22	11.00	PASS	
		5670	6.99	0.66	7.65	11.00	PASS	
	IEEE 802.11ac VHT40	5510						
5670								
IEEE 802.11ac VHT80	5530	4.68	0.66	5.34	11.00	PASS		
	5610	9.30	0.67	9.97	11.00	PASS		

BAND	Test Mode	Fre (MHz)	Power Density (dBm/500KHz)	Duty Factor (dB)	Total Power Density (dBm/500KHz)	Limit (dBm/500KHz)	Result
U-NII-3	802.11a	5745	7.48	0.67	8.15	30.00	PASS
		5785	8.82	0.67	9.49	30.00	PASS
		5825	7.76	0.67	8.43	30.00	PASS
	802.11n HT20	5745	8.21	0.69	8.90	30.00	PASS
		5785	8.25	0.69	8.94	30.00	PASS
		5825	8.08	0.69	8.77	30.00	PASS
	802.11ac VHT20	5745					
		5785					
		5825					
	802.11n HT40	5755	5.63	0.66	6.29	30.00	PASS
		5795	6.15	0.66	6.81	30.00	PASS
	802.11ac VHT40	5755					
		5795					
	802.11ac VHT80	5775	2.66	0.66	3.32	30.00	PASS

