FCC Part 15E
Measurement and Test Report

For

LM Technologies Ltd.

Unit 19, Spectrum House, 32-34, Gordon House Road, London, NW5 1LP,

United Kingdom

FCC ID: VVXLM842

FCC Rule(s):	FCC Part 15.407
Product Description:	LM842 WiFi and Bluetooth 5.0 Dual Mode Combination USB Adapter
Tested Model:	LM842
Report No.:	WTX19X12087485W-1
Sample Receipt Date:	Dec.17, 2019
Tested Date:	Dec.18, 2019 to Jan.19, 2020
Issued Date:	Jan.19, 2020
Tested By:	Mike Shi / Engineer
Reviewed By:	Silin Chen / EMC Manager
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Report version

Version No.	Date of issue	Description
Rev.00	Jan.19, 2020	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	LM Technologies Ltd.
Address of applicant:	Unit 19, Spectrum House, 32-34, Gordon House Road, London, NW5 1LP, United Kingdom
Manufacturer:	LM Technologies Ltd.
Address of manufacturer:	Unit 19, Spectrum House, 32-34, Gordon House Road, London, NW5 1LP, United Kingdom

General Description of EUT	
Product Name:	LM842 WiFi and Bluetooth 5.0 Dual Mode Combination USB Adapter
Brand Name:	LM Technologies
Model No.:	LM842
Adding Model(s):	842-8420, 842-8421, 842-8422, 842-8423, 842-8424
Rated Voltage:	DC 5V
Power Adapter:	/
Software Version:	/
Hardware Version:	/
Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model LM842, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT	
Support Standards:	802.11a, 802.11n(HT20) , 802.11n-HT40, 802.11ac-VH80
Frequency Range:	5150-5250MHz, 5725-5850MHz
RF Output Power (Max.):	5150-5250MHz:13.71dBm (Conducted) 5725-5850MHz:13.15dBm (Conducted)
Type of Modulation:	BPSK, QPSK,16QAM,64QAM, 256QAM
Data Rate:	6-54Mbps, up to 200Mbps
Type of Antenna:	Integral Antenna
Antenna Gain:	Antenna A: Band 1:3.77dBi; Band 4: 1.22dBi Antenna B: Band 1:3.3dBi; Band 4: 1.53dBi

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.407: General technical requirements.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
KDB789033 D02 v02r01: GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB789033 D02 v02r01
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Table for parameters of Test Software setting

Enter "Win7_MP_Kit_RTL11ac_8822CU_USB_v2.00_20190702 for Win7" into the calculator to enter the engineer mode, you can start to test. During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Mode	Ant.	Test Frequency (MHz)												
		NCB: 20MHz												
		5180	5200	5240	5260	5300	5320	5500	5580	5700	5720	5745	5785	5825
802.11a 6Mbps	ANT 1	70	70	70	/	/	/	/	/	/	/	60	60	60
	ANT 2	62	62	62	/	/	/	/	/	/	/	55	55	55
802.11n-HT20 MCS0	ANT 1	70	70	70	/	/	/	/	/	/	/	60	60	60
	ANT 2	62	62	62	/	/	/	/	/	/	/	55	55	55
Mode	Ant.	NCB: 40MHz												
		5190	5230	5270	5310	5510	5550	5670	5710	5755	5795			
802.11n-HT40 MCS0	ANT 1	72	72	/	/	/	/	/	/	70	70			
	ANT 2	64	64	/	/	/	/	/	/	81	81			
Mode	Ant.	NCB: 80MHz												
		5210	5290	5530	5610	5690	5775							
802.11ac-VH80 MCS0/Nss2	ANT 1	72	/	/	/	/	66							
	ANT 2	64	/	/	/	/	81							

1.5 EUT Operating during test

EUT was programmed to be in continuously transmitting mode. During the test, EUT operation to normal function and programs under Android were executed.

1.6 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintain ed in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.7 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11a	5180MHz,5200MHz,5240MHz, 5745MHz, 5785MHz,5825MHz
TM2	802.11n-HT20	5180MHz,5200MHz,5240MHz,5745MHz, 5785MHz,5825MHz
TM3	802.11n-HT40	5190MHz,5230MHz, 5755MHz,5795MHz
TM4	802.11ac-VH80	5210MHz ,5775 MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
USB extension cable	1.2	Shielded	With Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E445	/

1.8 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.9 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2019-04-30	2020-04-29
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2019-04-30	2020-04-29
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2019-04-30	2020-04-29
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2019-04-30	2020-04-29
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2019-04-30	2020-04-29
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
SEMT-1042	Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2019-05-05	2021-05-04
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2019-04-30	2020-04-29
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2019-04-30	2020-04-29
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2019-04-30	2020-04-29
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2019-04-30	2020-04-29
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2019-04-30	2020-04-29
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2019-04-30	2020-04-29
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2019-05-05	2021-05-04
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2019-04-30	2020-04-29
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2019-04-30	2020-04-29
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2019-04-30	2020-04-29
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2019-03-18	2020-03-17
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2019-03-18	2020-03-17
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2019-03-18	2020-03-17
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2019-03-18	2020-03-17
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2019-03-18	2020-03-17
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2019-03-18	2020-03-17

Software List			
Description	**Manufacturer**	**Model**	**Version**
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

*Remark: indicates software version used in the compliance certification testing

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203; §15.405	Antenna Requirement	Compliant
§15.207; §15.407(b)(6)	Conducted Emission	Compliant
§15.407(a)(1),(2)	Power Spectral Density	Compliant
§15.407(e)	Emission Bandwidth and Occupied Bandwidth	Compliant
§15.407(a)(1),(2)	Maximum Conducted Output Power	Compliant
§15.407(b)(1),(2),(3),(4)	Undesirable emission	Compliant
§15.205; §15.407(b)(1),(2),(3)	Radiated Emission	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.407(h)	Dynamic Frequency Selection (DFS)	Compliant

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to §1.1307 and §2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the MPE Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.2 Evaluation Information

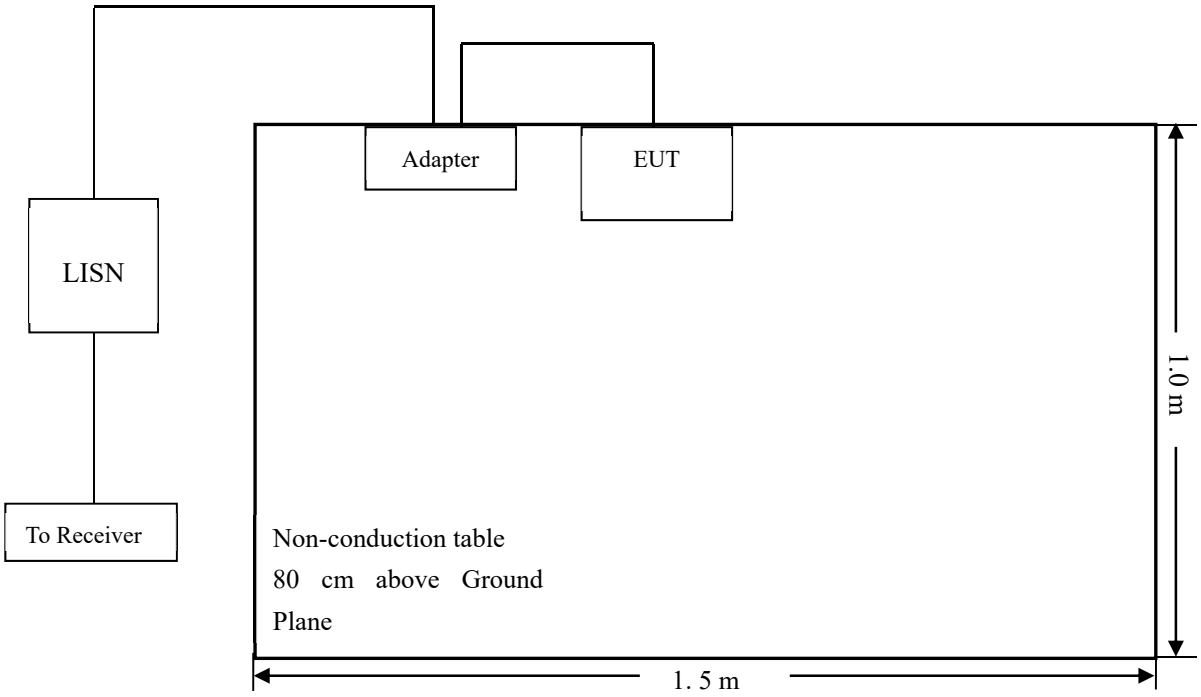
This product has two integral antennas, fulfill the requirement of this section.

5. Conducted Emissions

5.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.

5.2 Basic Test Setup Block Diagram



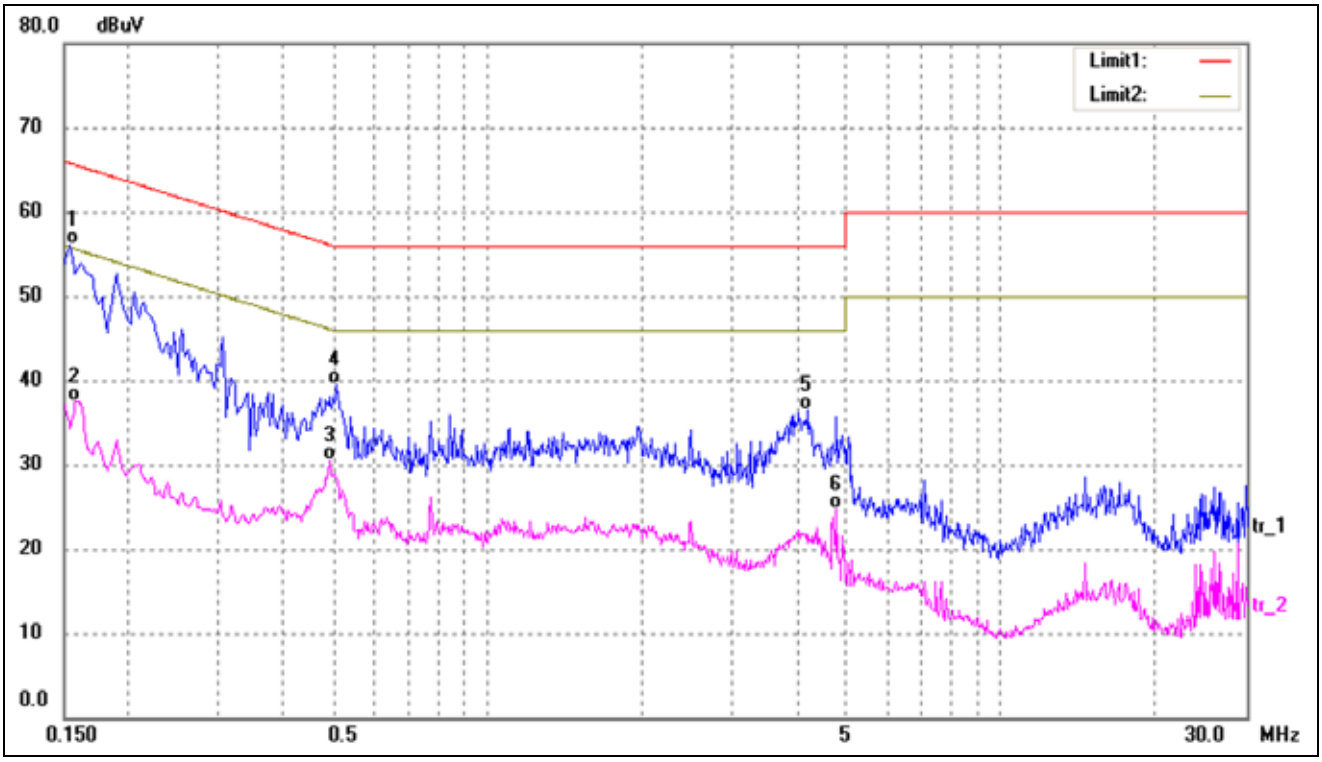
5.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency ..... 150 kHz
Stop Frequency ..... 30 MHz
Sweep Speed ..... Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth ..... 9 kHz
Quasi-Peak Adapter Mode ..... Normal

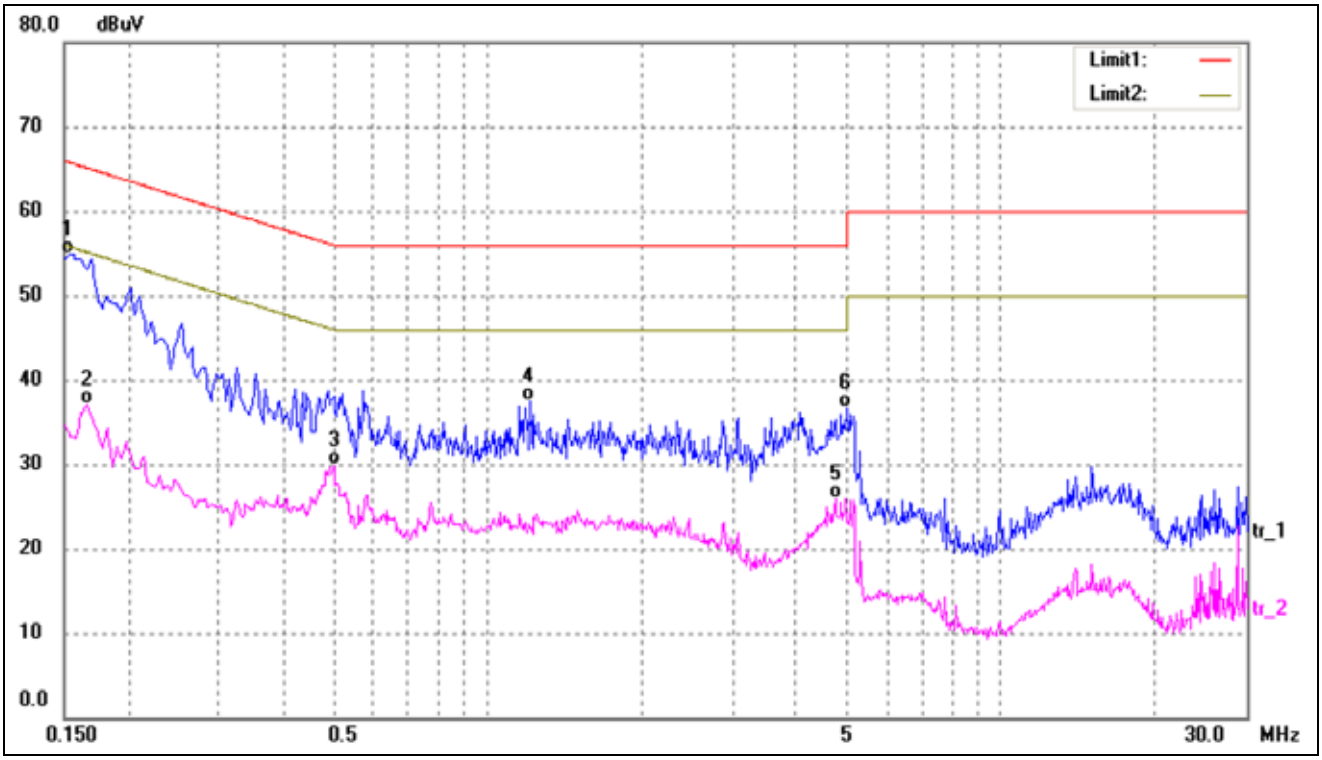
5.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1540	46.13	9.95	56.08	65.78	-9.70	QP
2	0.1580	27.55	9.95	37.50	55.57	-18.07	AVG
3	0.4940	20.53	10.02	30.55	46.10	-15.55	AVG
4	0.5100	29.39	10.02	39.41	56.00	-16.59	QP
5	4.2020	26.17	10.31	36.48	56.00	-19.52	QP
6	4.7900	14.31	10.37	24.68	46.00	-21.32	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1540	45.01	9.95	54.96	65.78	-10.82	QP
2	0.1660	27.13	9.95	37.08	55.16	-18.08	AVG
3	0.5020	19.81	10.02	29.83	46.00	-16.17	AVG
4	1.2140	27.18	10.38	37.56	56.00	-18.44	QP
5	4.7500	15.59	10.36	25.95	46.00	-20.05	AVG
6	5.0260	26.39	10.38	36.77	60.00	-23.23	QP

6. Power Spectral Density

6.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

6.2 Test Procedure

According to 789033 D02 v02r01 General UNII Test Procedures New Rules v02, the following is the measurement procedure.
For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.l.a).
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHZ is available on nearly all spectrum analyzers.

6.3 Summary of Test Results/Plots

U-NII-1:5150-5250MHz (Antenna A)			
Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	5.36	11
	5200	5.32	11
	5240	5.38	11

U-NII-1:5150-5250MHz (Antenna B)			
Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	5.67	11
	5200	6.23	11
	5240	5.77	11

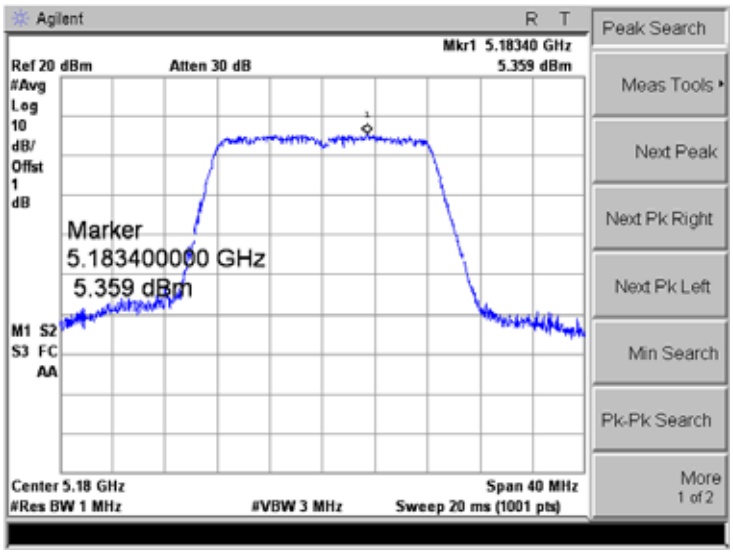
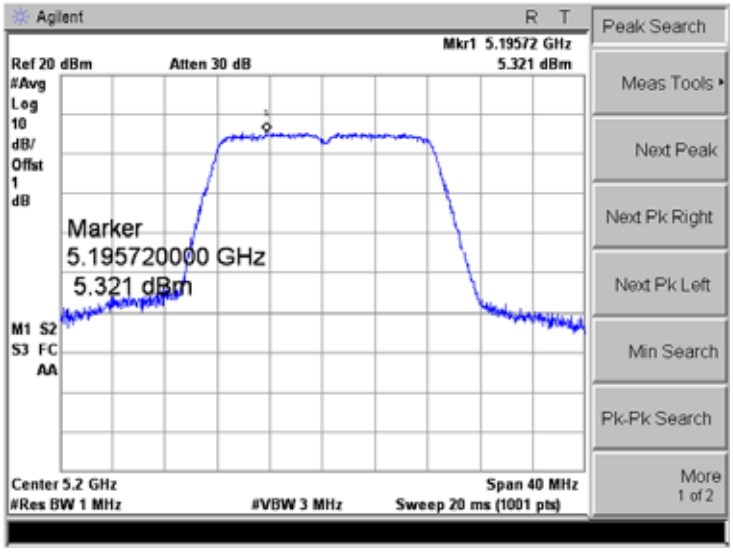
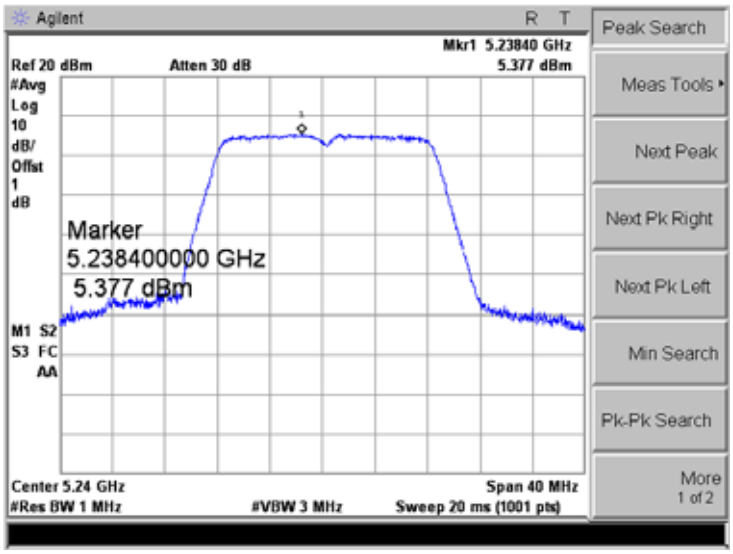
U-NII-1:5150-5250MHz (Antenna A+ Antenna B)					
Operating mode	Test Channel	ANT A Power Spectral Density dBm/MHz	ANT B Power Spectral Density dBm/MHz	ANT A+B Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11n-HT20	5180	5.28	6.03	8.68	11
	5200	5.45	6.08	8.79	11
	5240	5.70	5.93	8.83	11
802.11n-HT40	5190	1.63	2.84	5.29	11
	5230	1.59	3.42	5.61	11
802.11ac-HT80	5210	-0.88	0.37	2.80	11

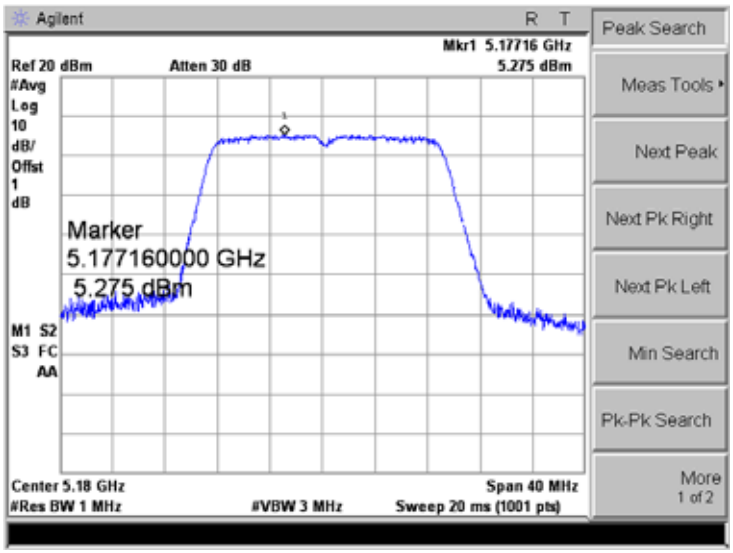
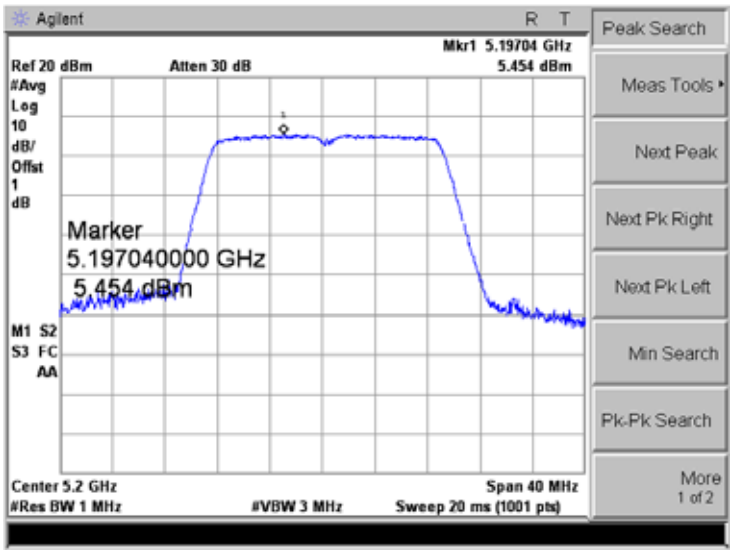
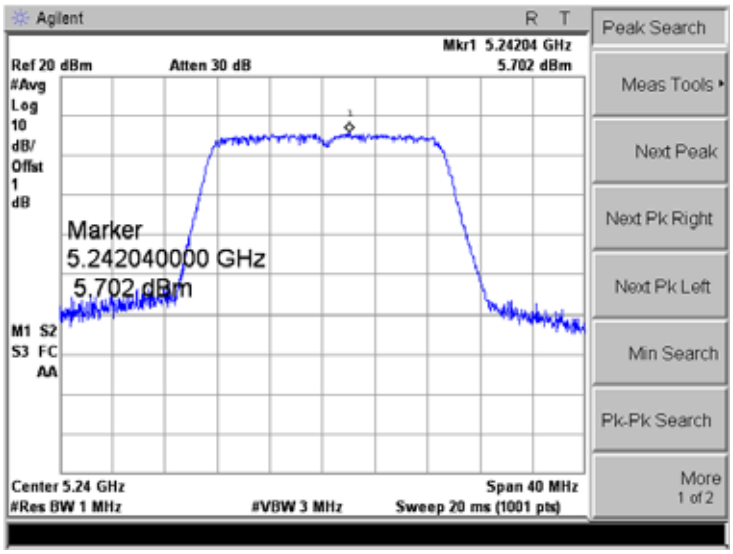
U-NII-3: 5725-5850MHz(Antenna A)					
Operating mode	Test Channel	Power Spectral Density dBm/300kHz	Factor	Power Spectral Density* dBm/500kHz	Limit dBm/500kHz
802.11a	5745	1.36	2.22	3.58	30
	5785	1.46	2.22	3.68	30
	5825	1.54	2.22	3.76	30
*Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22					

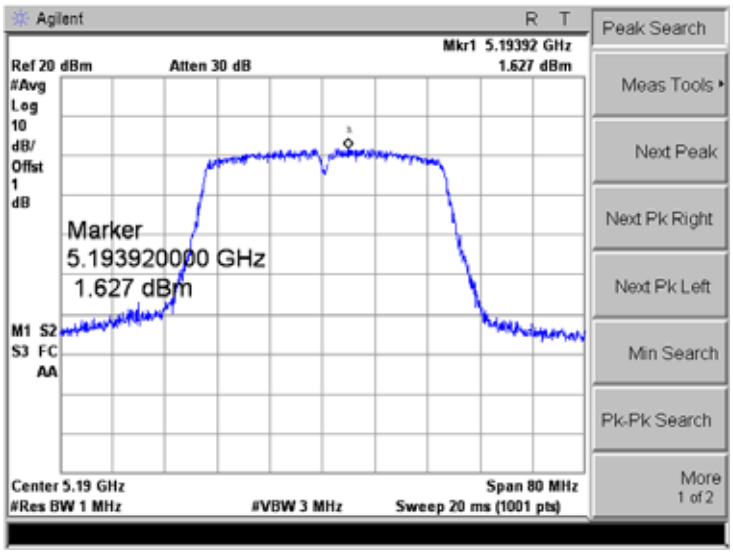
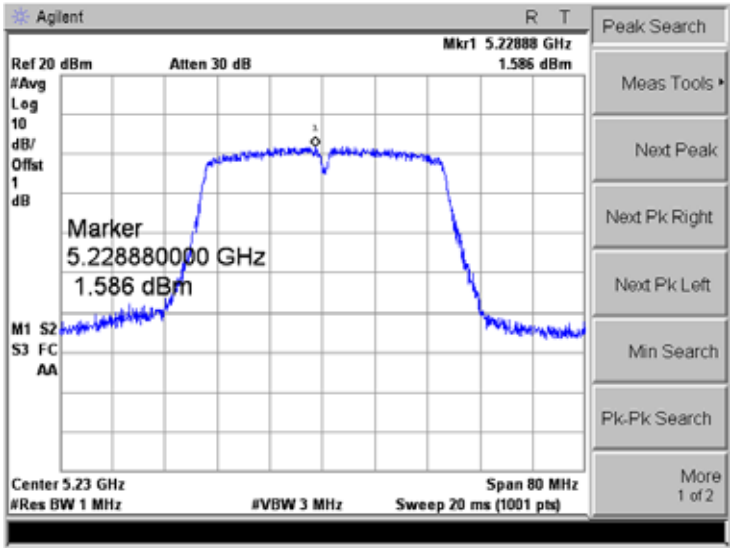
U-NII-3: 5725-5850MHz (Antenna B)					
Operating mode	Test Channel	Power Spectral Density dBm/300kHz	Factor	Power Spectral Density* dBm/500kHz	Limit dBm/500kHz
802.11a	5745	2.31	2.22	4.53	30
	5785	1.55	2.22	3.77	30
	5825	2.55	2.22	4.77	30
*Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22					

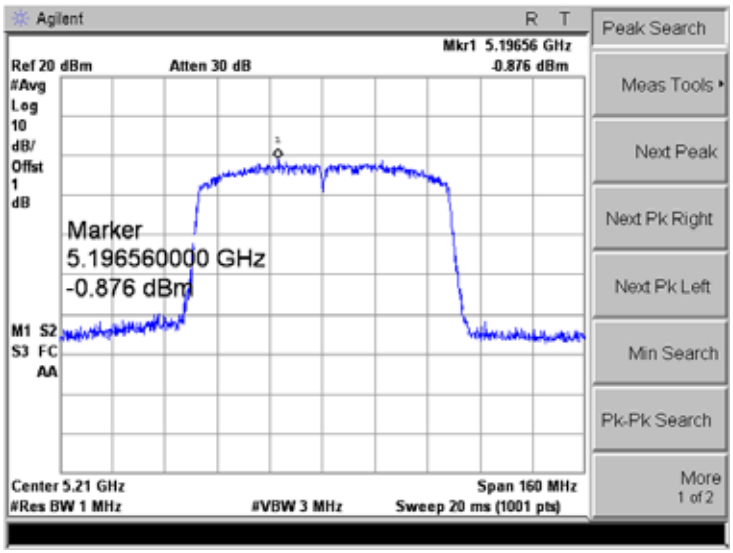
U-NII-3: 5725-5850MHz (Antenna A+ Antenna B)						
Operating mode	Test Channel	ANT A Power Spectral Density dBm/300kHz	ANT B Power Spectral Density dBm/300kHz	Factor	ANT A+B Power Spectral Density* dBm/500kHz	Limit dBm/500kHz
802.11n-HT20	5745	1.58	0.93	2.22	3.80	30
	5785	0.29	1.21	2.22	2.51	30
	5825	0.76	1.20	2.22	2.98	30
802.11n HT40	5755	-1.52	-1.87	2.22	0.70	30
	5795	-1.86	-2.47	2.22	0.36	30
802.11ac VH80	5775	-5.19	-4.94	2.22	-2.97	30
*Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22						

➢ Antenna A: 5150-5250MHz

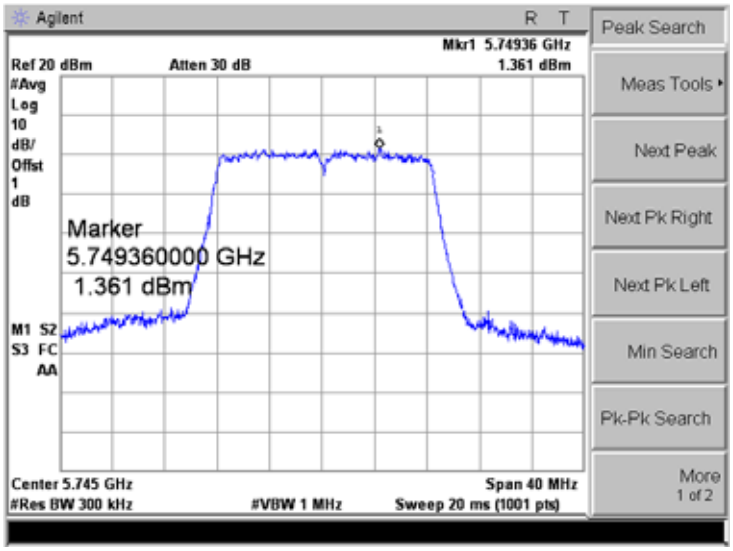
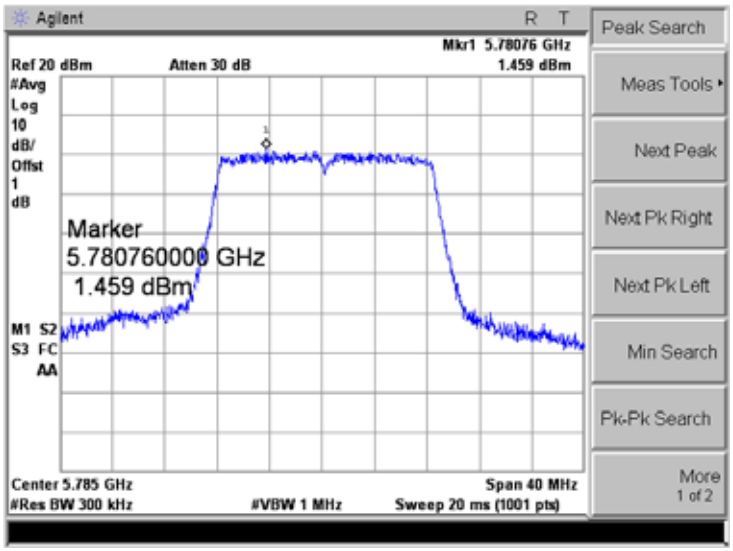
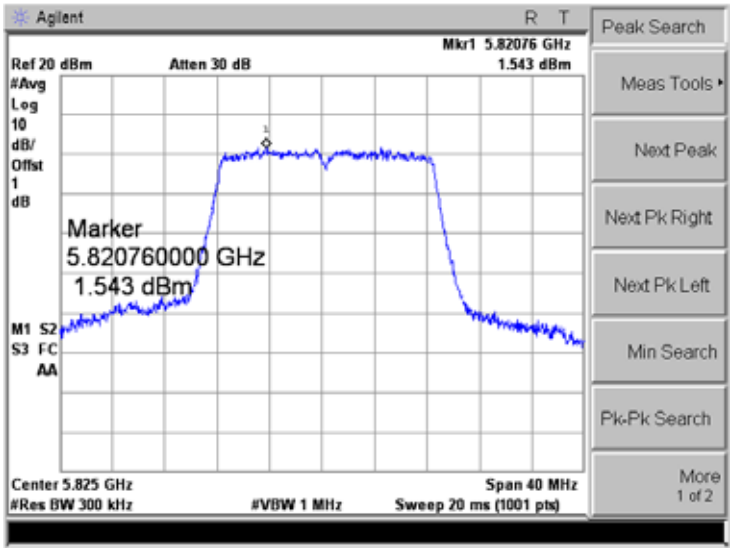
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

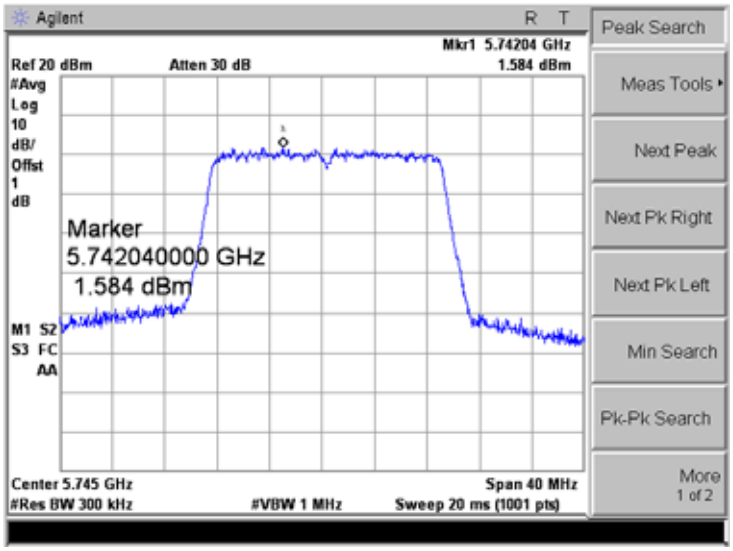
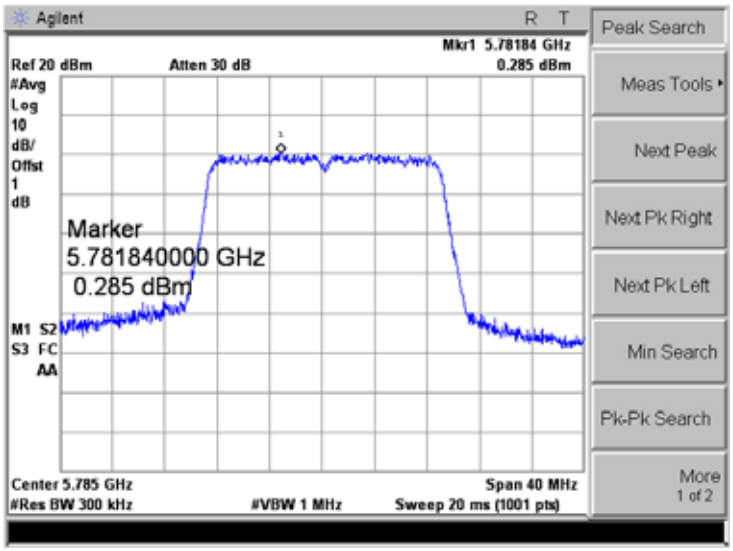
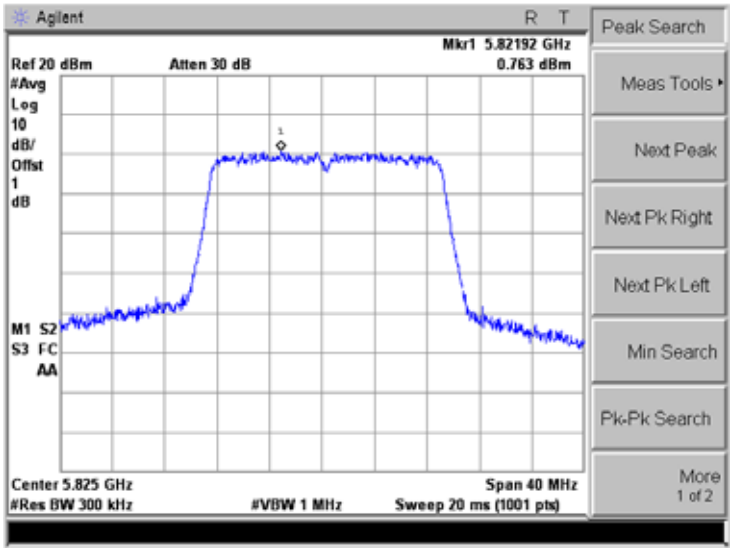
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

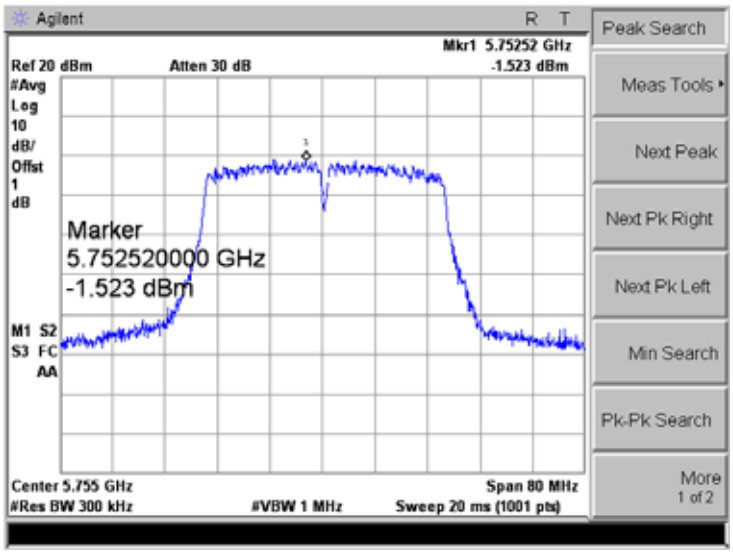
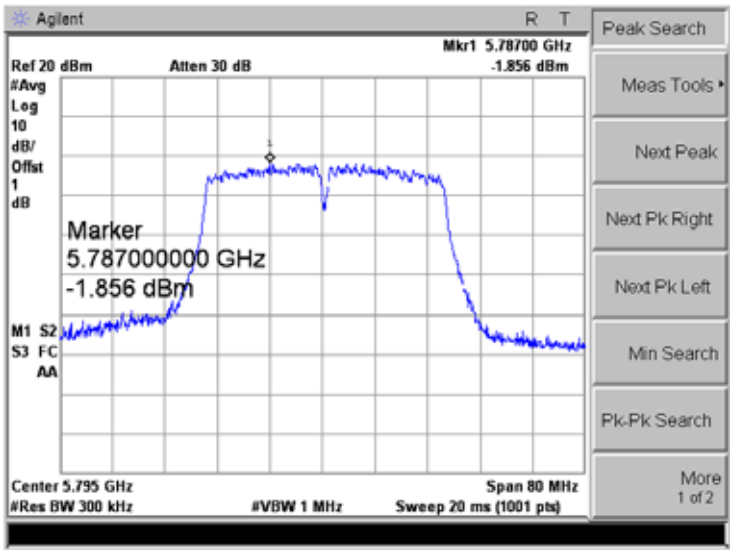
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

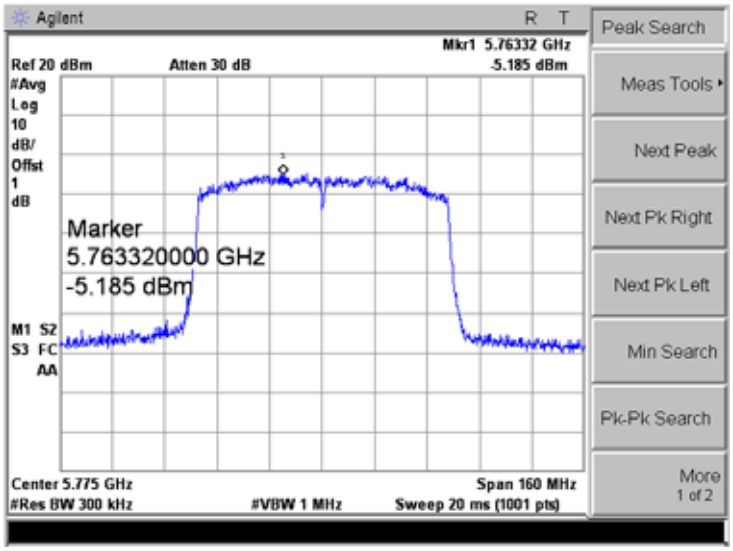
Mode:	802.11ac VH80
5210MHz	

➢ Antenna A: 5725-5850MHz

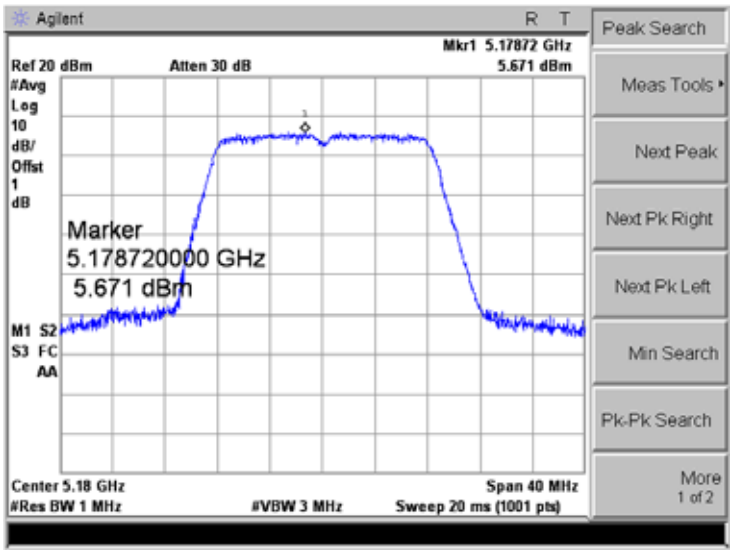
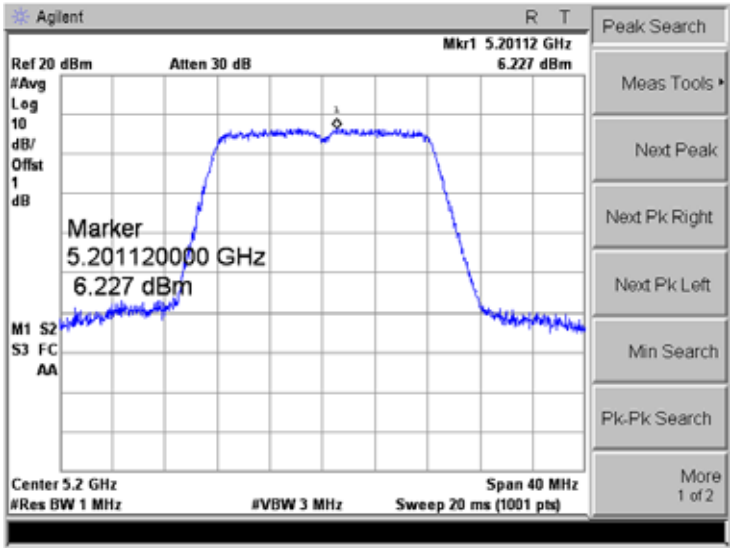
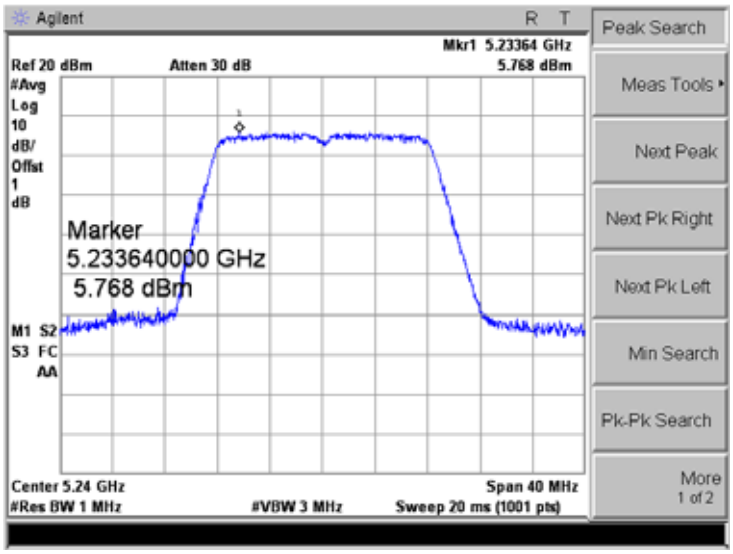
Mode:	**802.11a**
5745MHz	
5785MHz	
5825MHz	

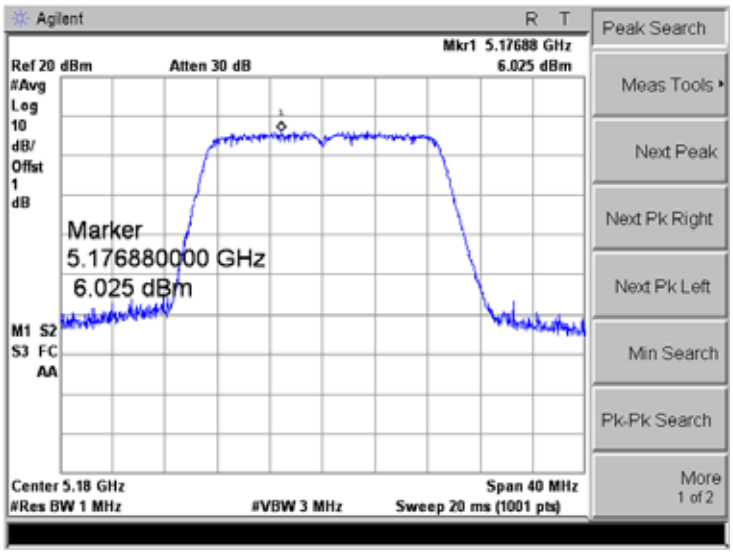
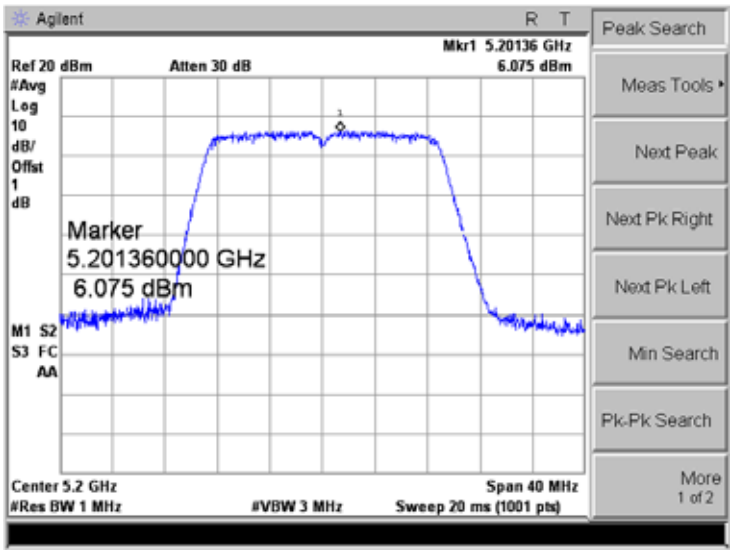
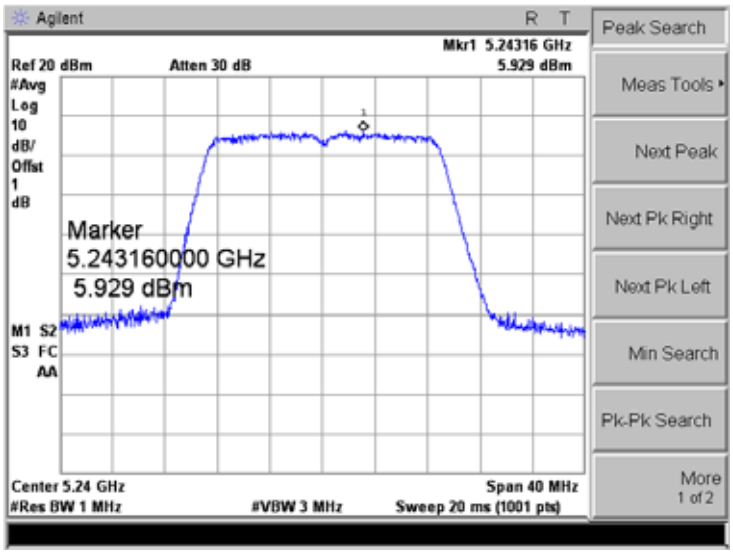
Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

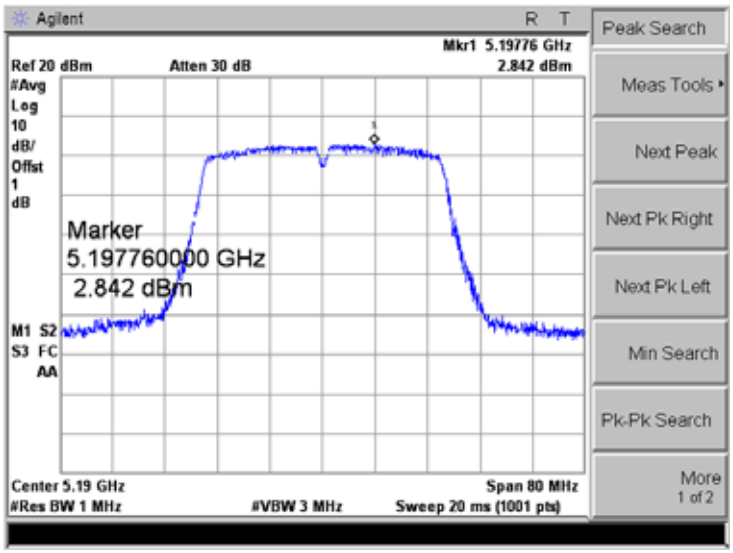
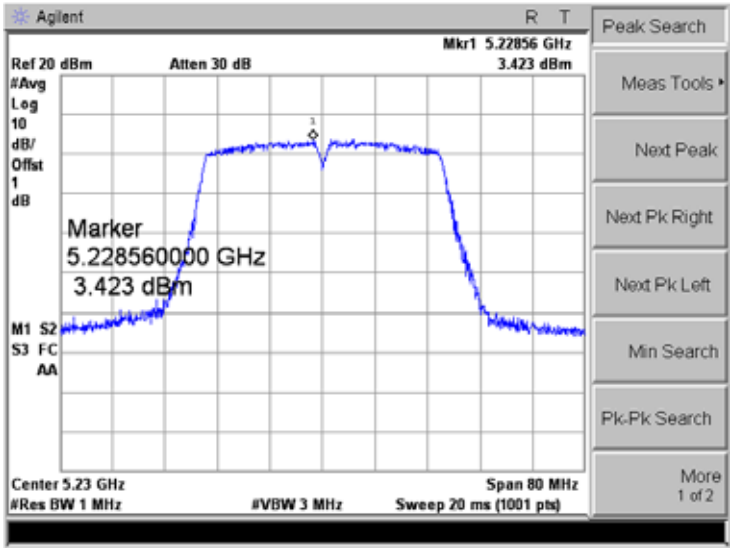
Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

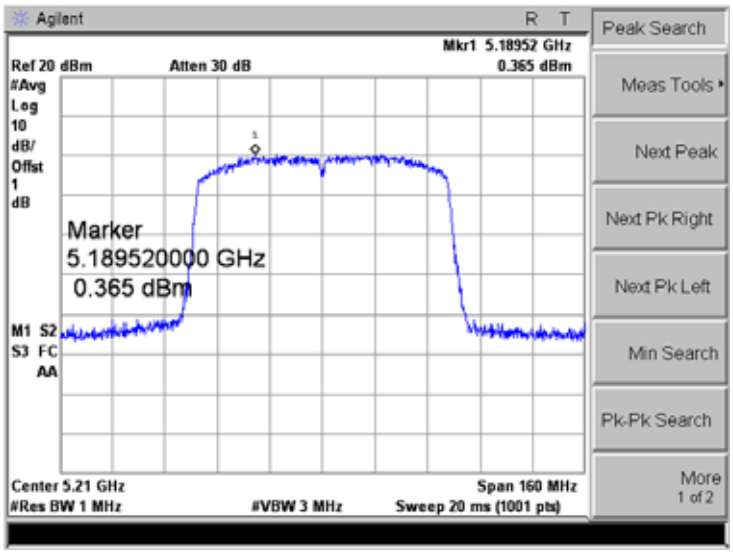
Mode:	802.11ac VH80
5775 MHz	

➢ Antenna B: 5150-5250MHz

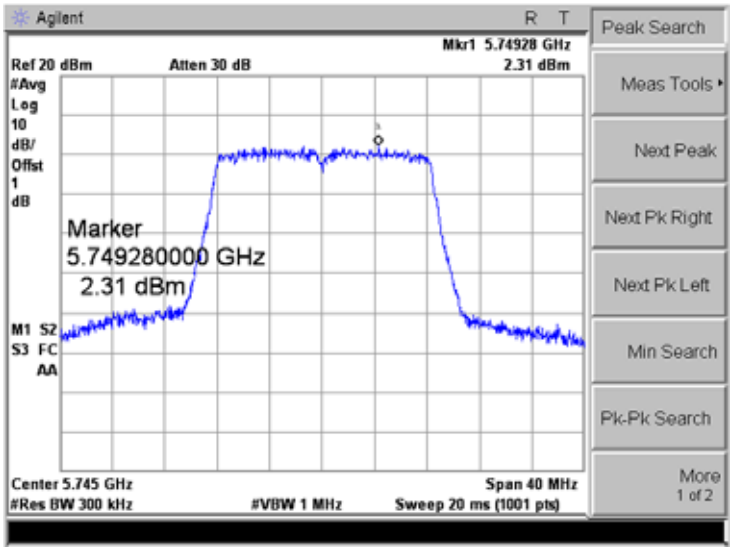
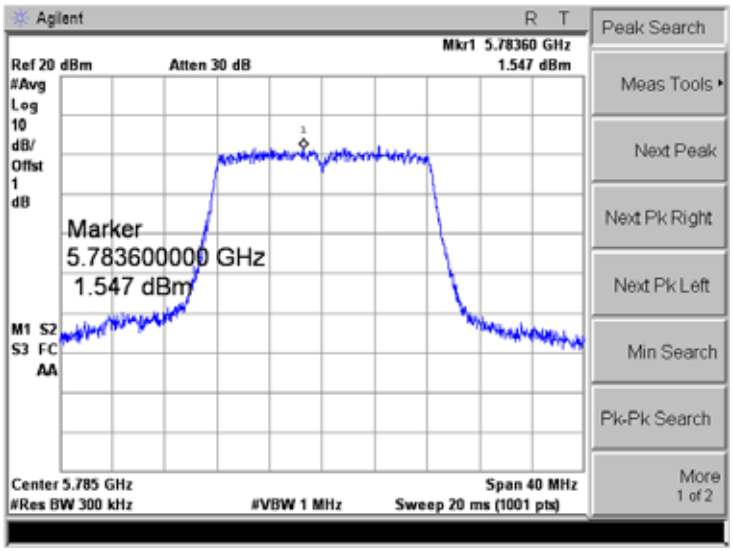
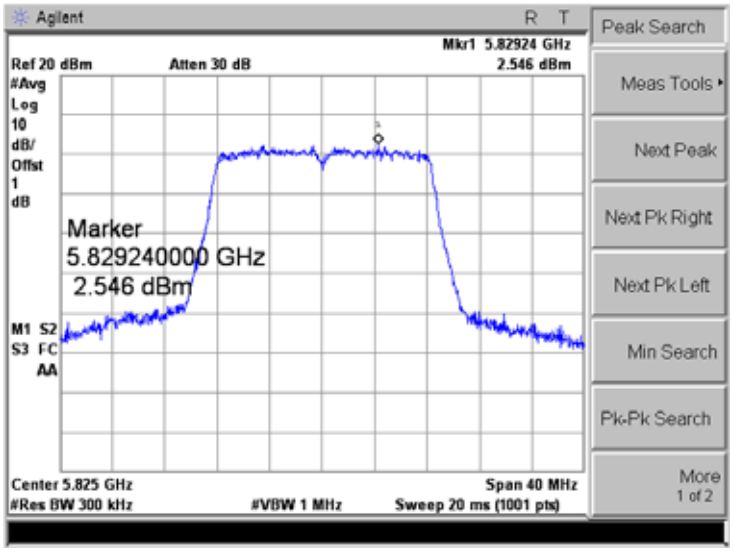
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

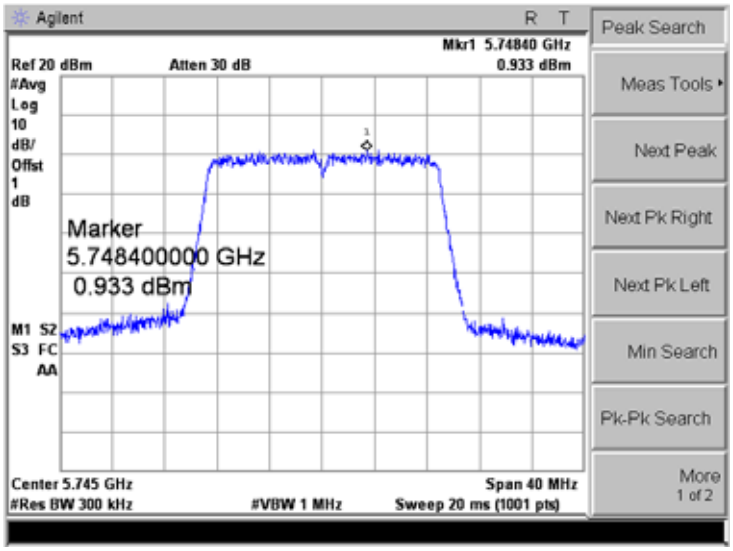
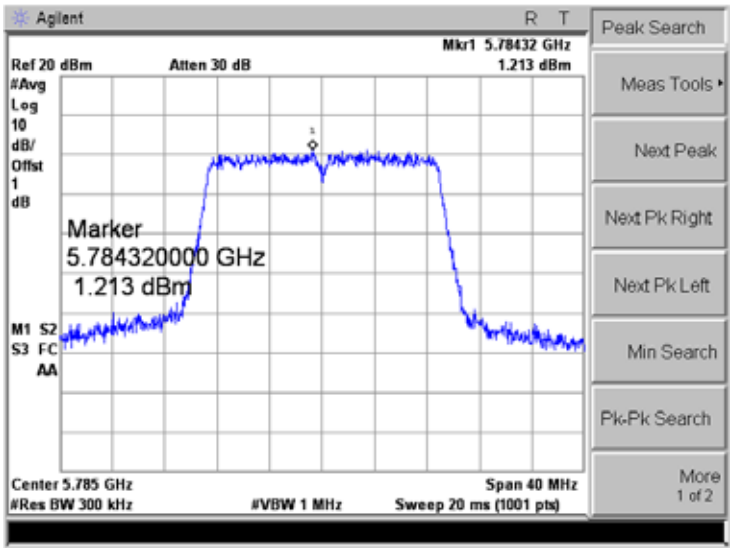
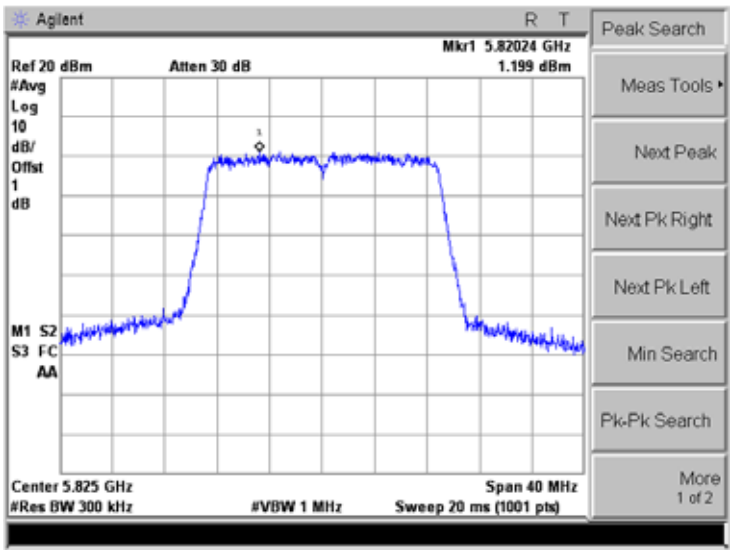
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

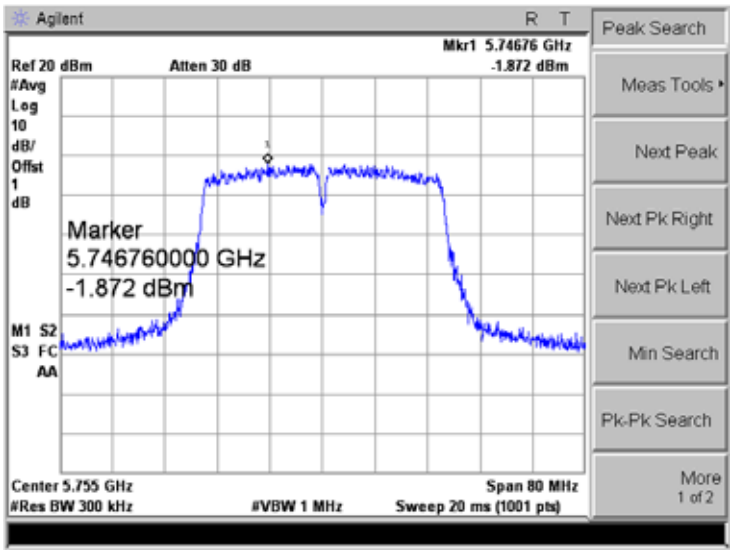
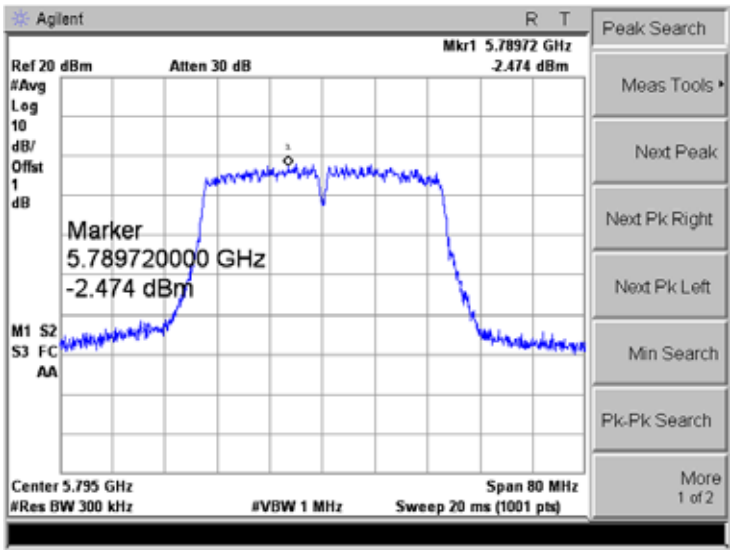
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

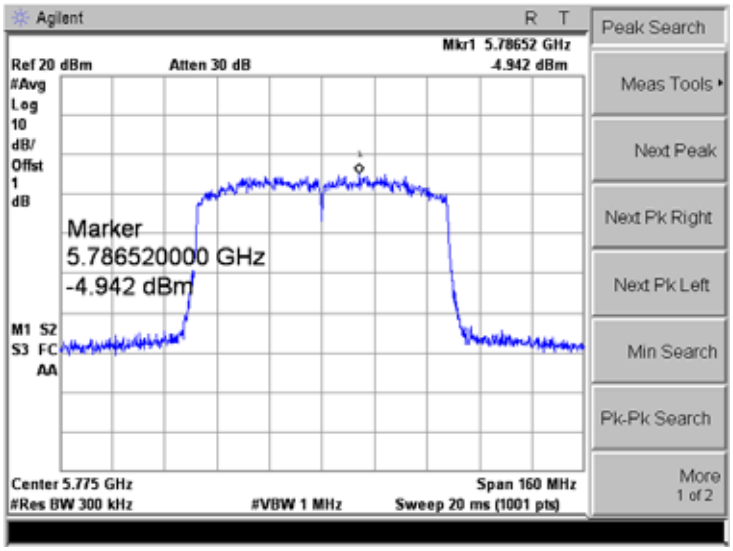
Mode:	802.11ac VH80
5210MHz	

➢ Antenna 1: 5725-5850MHz

Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

7. Emission Bandwidth and Occupied Bandwidth

7.1 Standard Applicable

According to 15.407(a) and (e):

(1) For the band 5.15-5.25 GHz.
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

7.2 Test Procedure

According to 789033 D02 v02r0r section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare

this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth
The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v02r01 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

The following procedure shall be used for measuring (99 %) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 * RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

7.3 Summary of Test Results/Plots

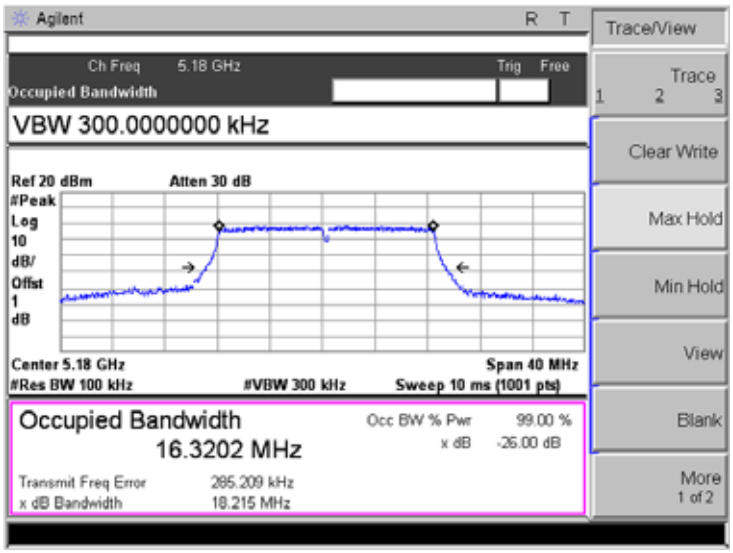
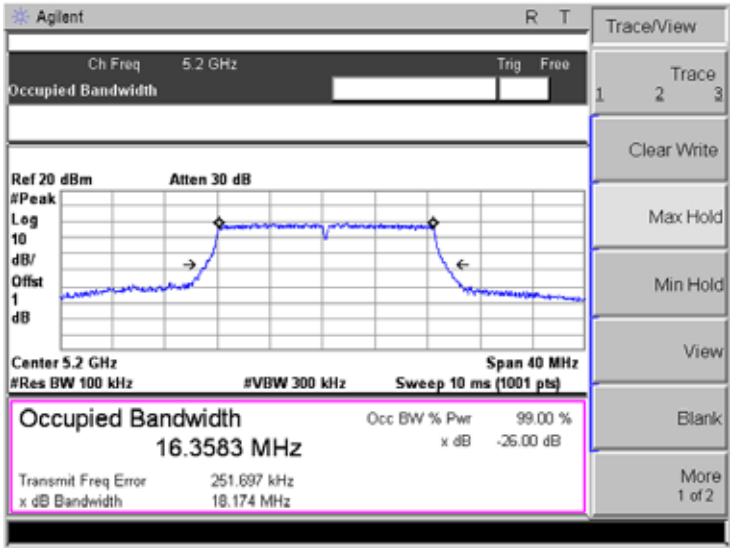
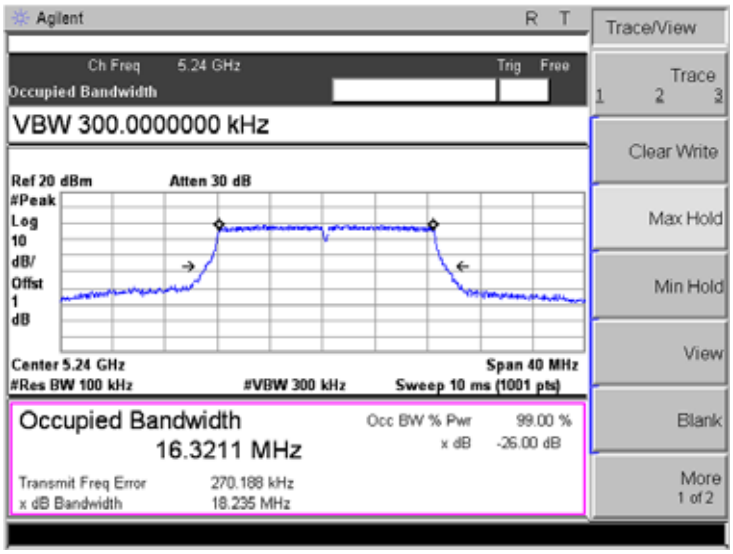
U-NII-1:5150-5250MHz(Antenna A)				
Test Mode	**Test Channel MHz**	**26 dB Bandwidth MHz**	**99% Bandwidth MHz**	**verdict**
802.11a	5180	18.215	16.3202	Pass
	5200	18.174	16.3583	Pass
	5240	18.235	16.3211	Pass
802.11n-HT20	5180	19.269	17.5475	Pass
	5200	19.323	17.5802	Pass
	5240	19.280	17.5483	Pass
802.11n-HT40	5190	39.600	35.9410	Pass
	5230	39.323	35.9544	Pass
802.11ac-HT80	5210	78.741	74.6519	Pass

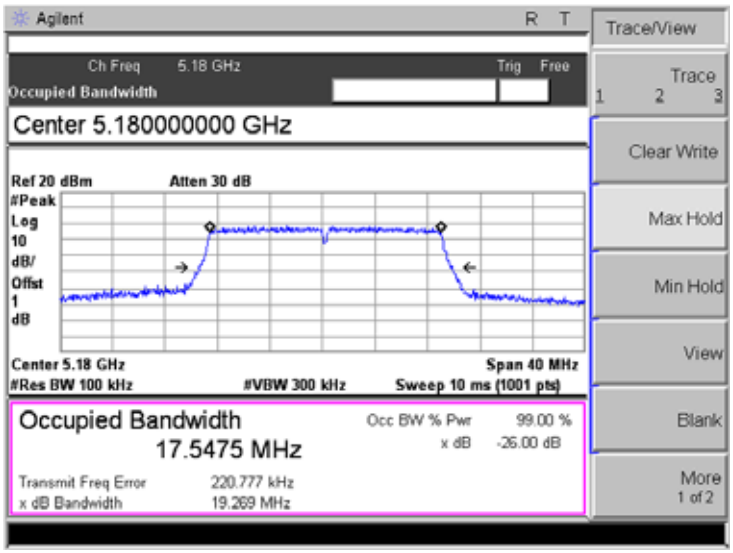
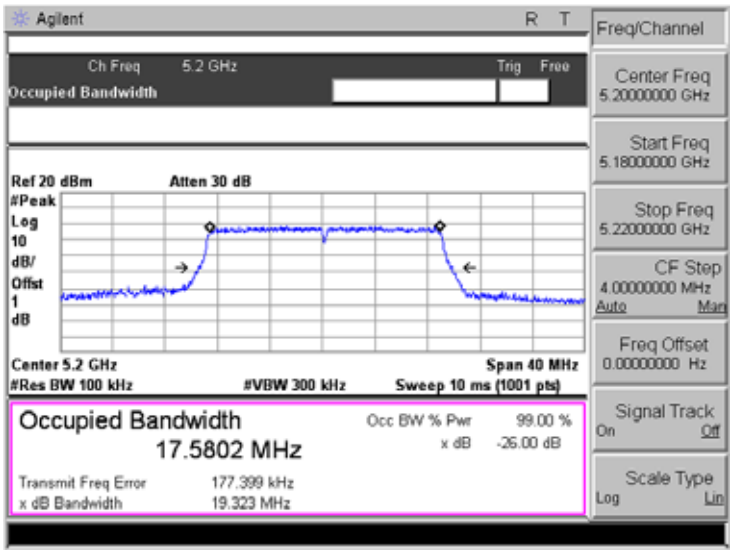
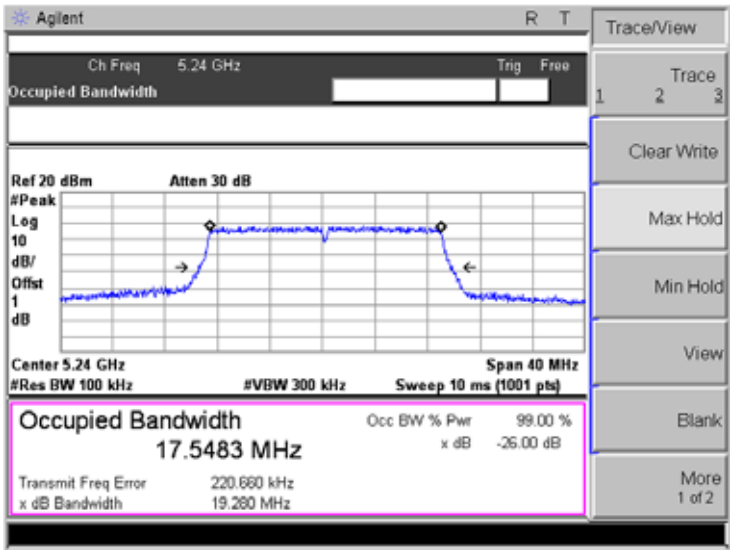
U-NII-3: 5725-5850MHz(Antenna A)				
Test Mode	**Test Channel MHz**	**6 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit kHz**
802.11a	5745	16.452	16.3265	≥500
	5785	16.429	16.3140	≥500
	5825	16.424	16.3251	≥500
802.11n-HT20	5745	17.668	17.5282	≥500
	5785	17.653	17.5362	≥500
	5825	17.656	17.5403	≥500
802.11n-HT40	5755	36.403	35.9303	≥500
	5795	36.411	35.9483	≥500
802.11ac VH80	5775	74.697	74.6269	≥500

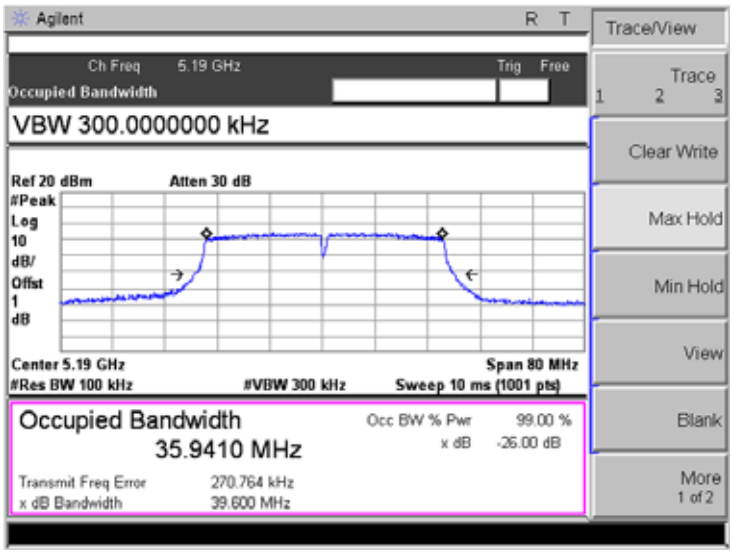
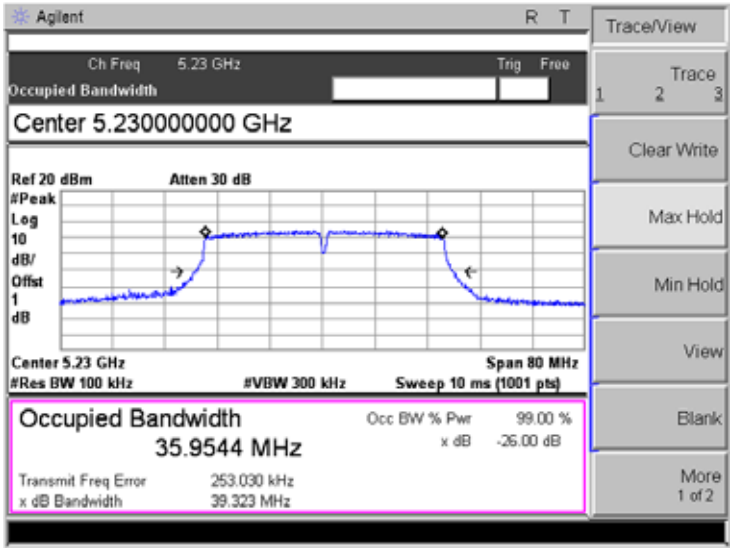
U-NII-1:5150-5250MHz(Antenna B)				
Test Mode	**Test Channel MHz**	**26 dB Bandwidth MHz**	**99% Bandwidth MHz**	**verdict**
802.11a	5180	18.153	16.3151	Pass
	5200	18.200	16.3153	Pass
	5240	18.125	16.3243	Pass
802.11n-HT20	5180	19.280	17.5330	Pass
	5200	19.264	17.5333	Pass
	5240	19.189	17.5338	Pass
802.11n-HT40	5190	39.284	35.9340	Pass
	5230	39.049	35.9191	Pass
802.11ac-HT80	5210	78.815	74.5969	Pass

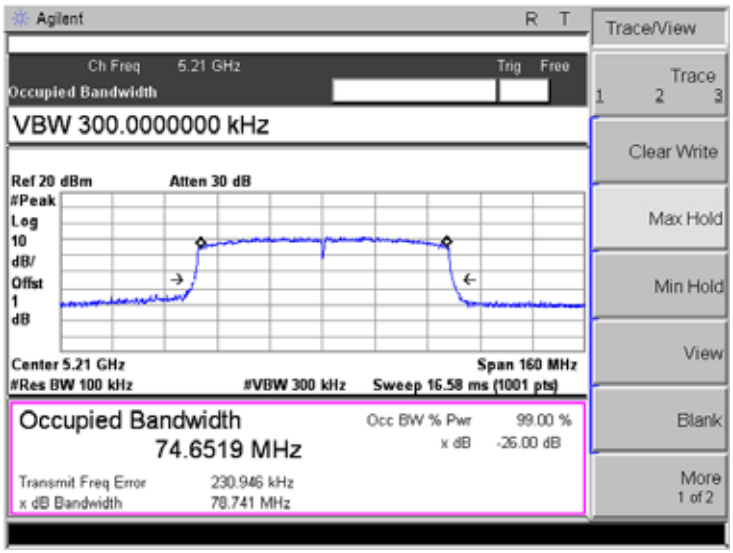
U-NII-3: 5725-5850MHz(Antenna 1)				
Test Mode	**Test Channel MHz**	**6 dB Bandwidth MHz**	**99% Bandwidth MHz**	**Limit kHz**
802.11a	5745	16.425	16.3086	≥500
	5785	16.440	16.3204	≥500
	5825	16.422	16.3159	≥500
802.11n-HT20	5745	17.699	17.5408	≥500
	5785	17.687	17.5411	≥500
	5825	17.669	17.5360	≥500
802.11n-HT40	5755	36.387	35.9313	≥500
	5795	36.376	35.9271	≥500
802.11ac VH80	5775	75.228	74.6697	≥500

➢ Antenna A: 5150-5250MHz

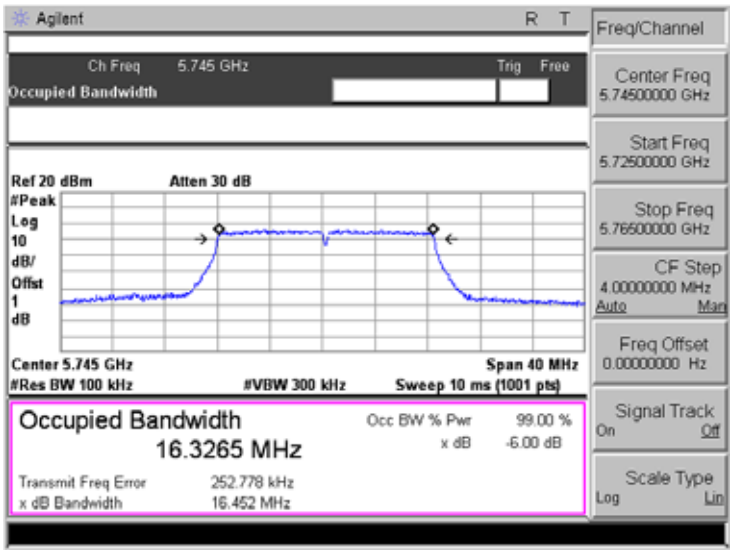
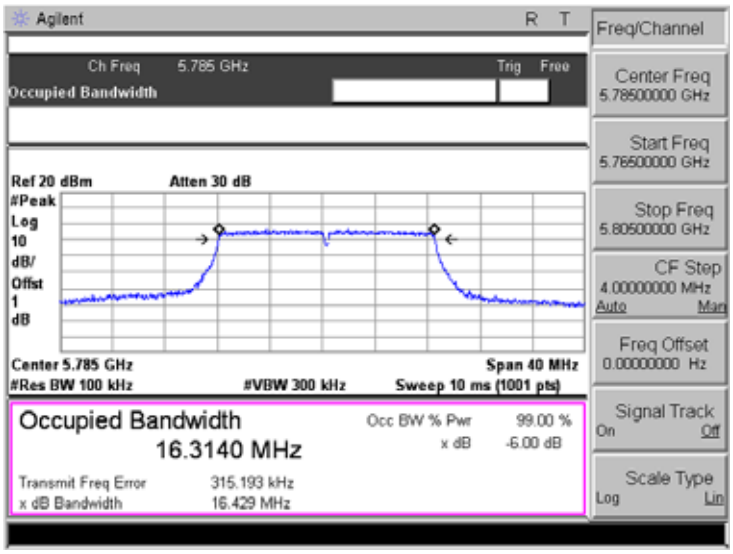
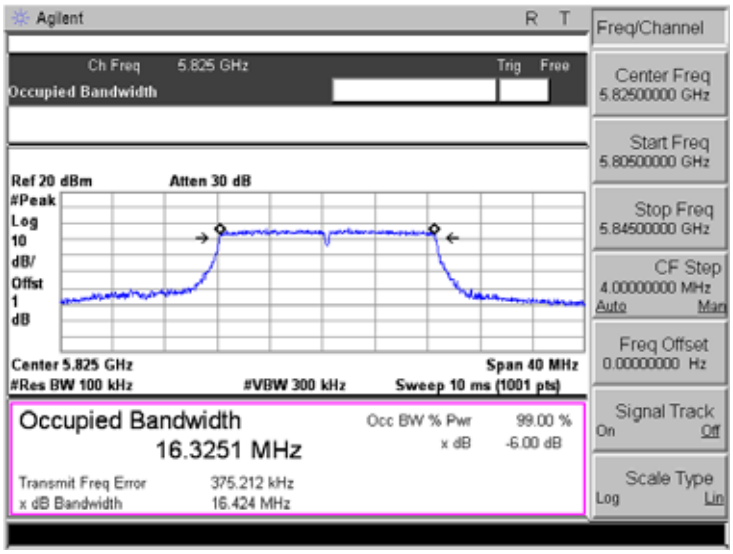
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

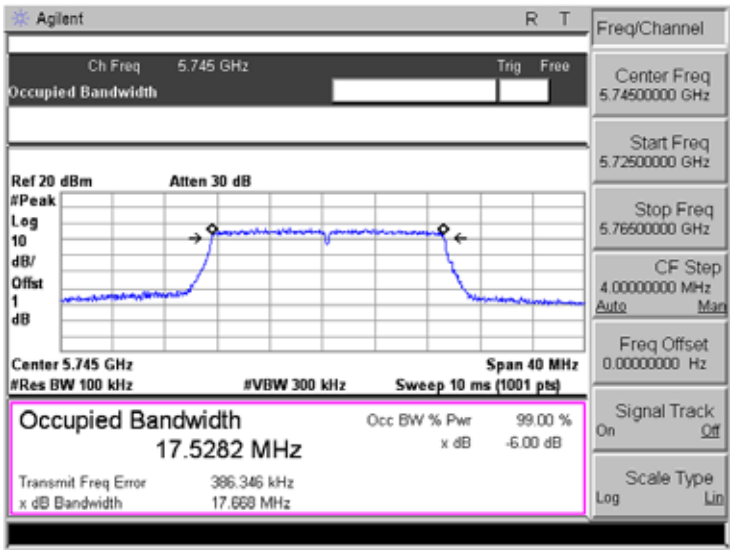
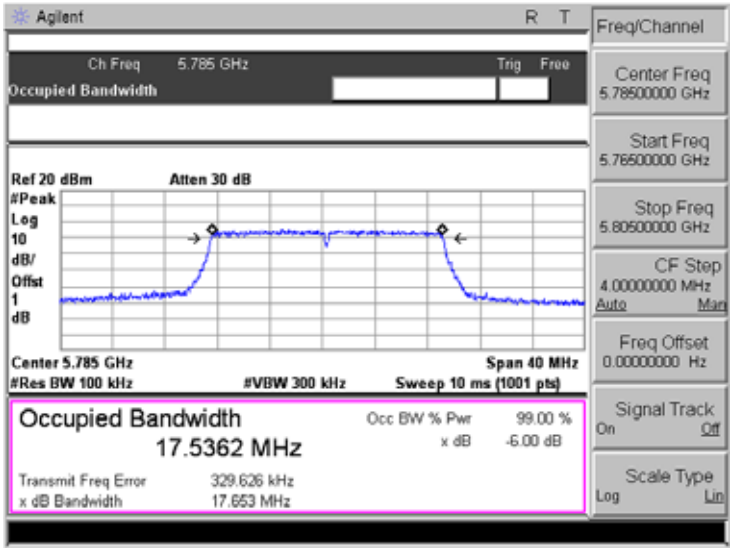
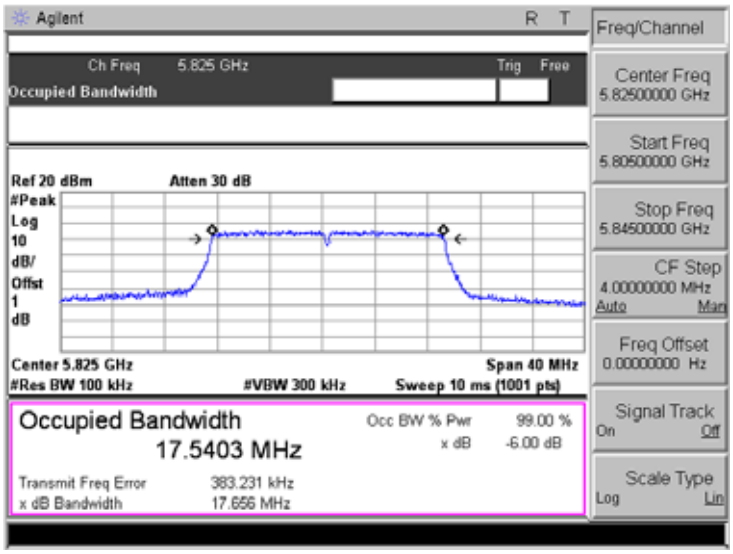
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

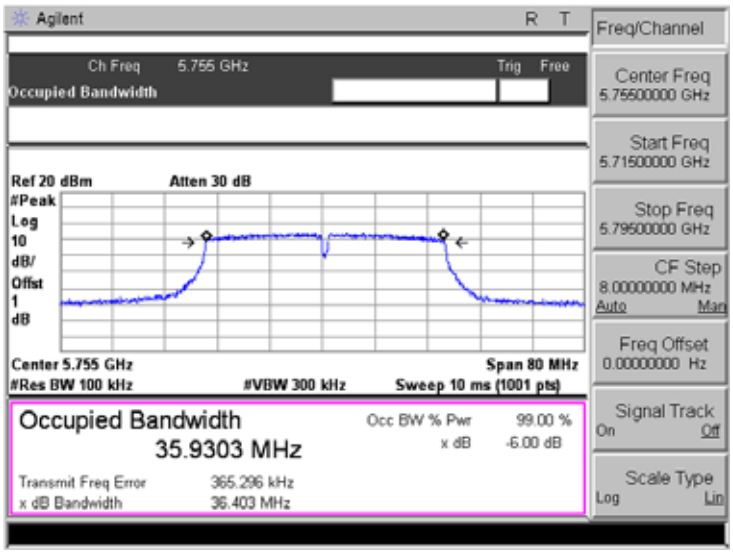
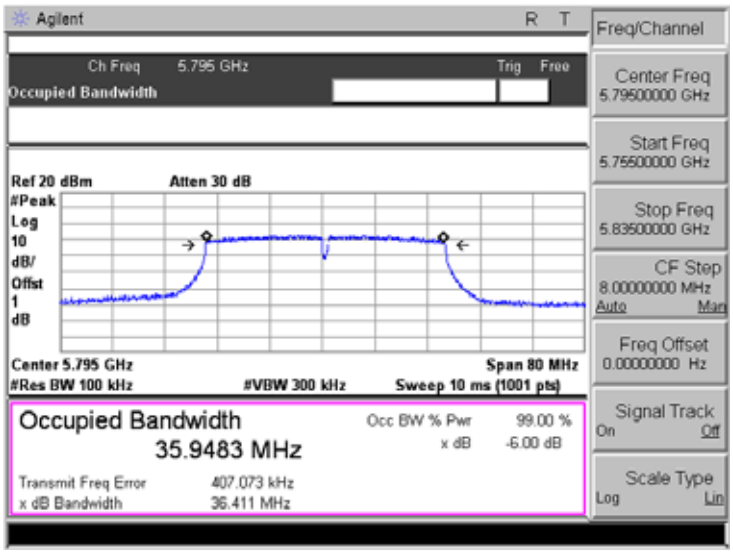
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

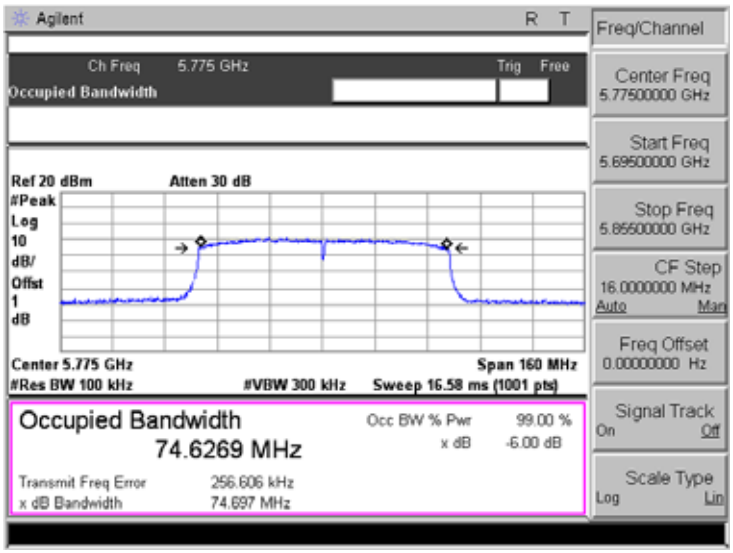
Mode:	802.11ac VH80
5210MHz	

➢ Antenna A: 5725-5850MHz

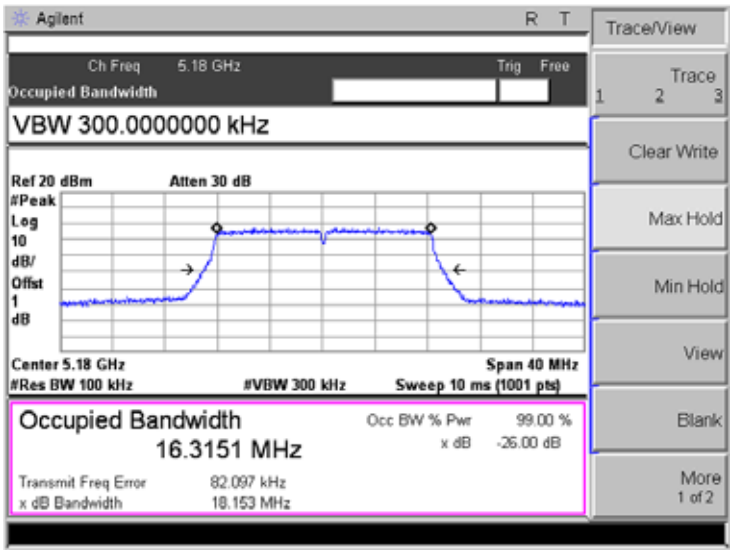
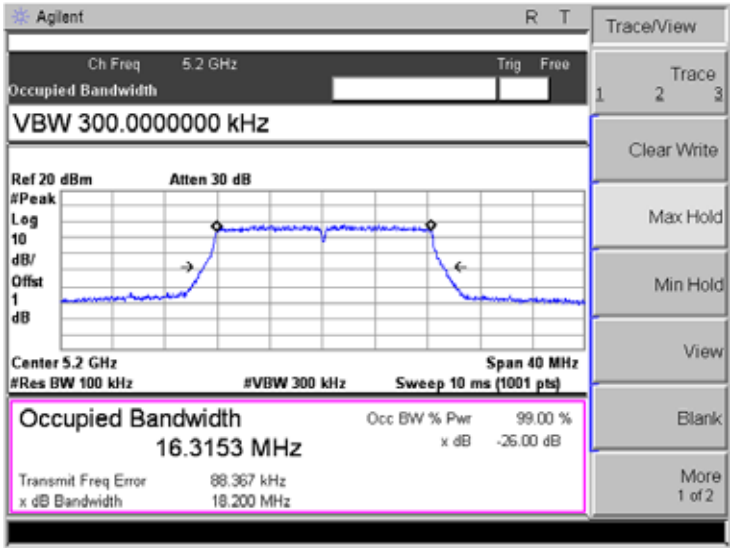
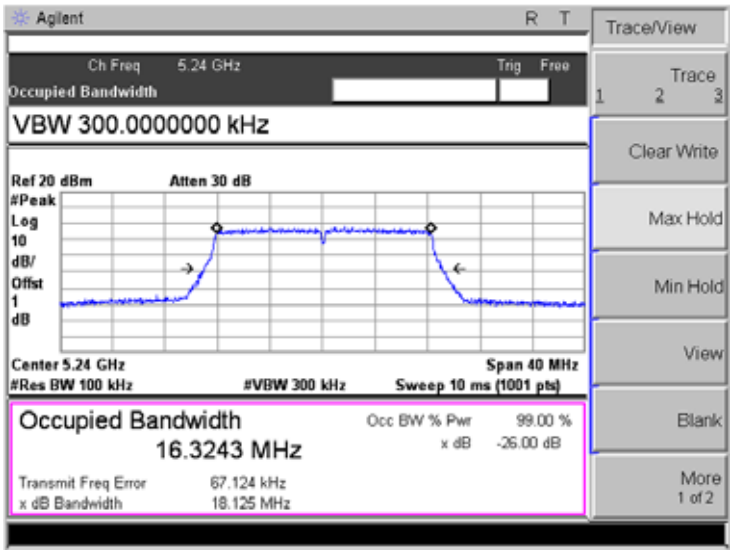
Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

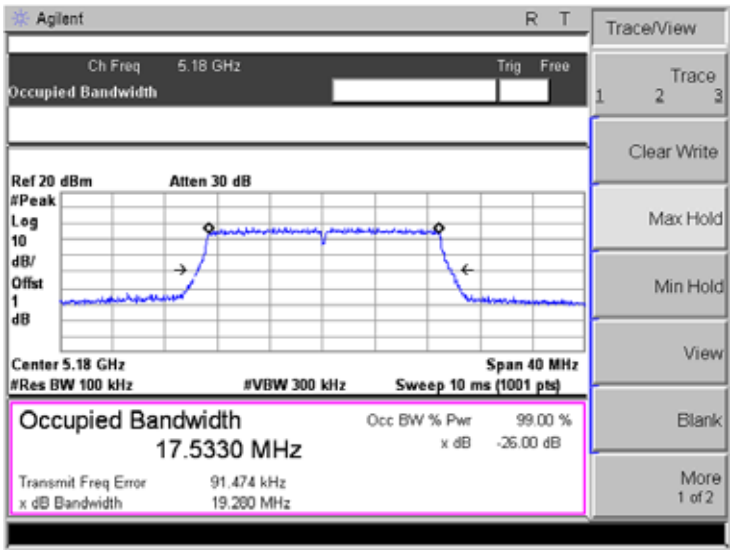
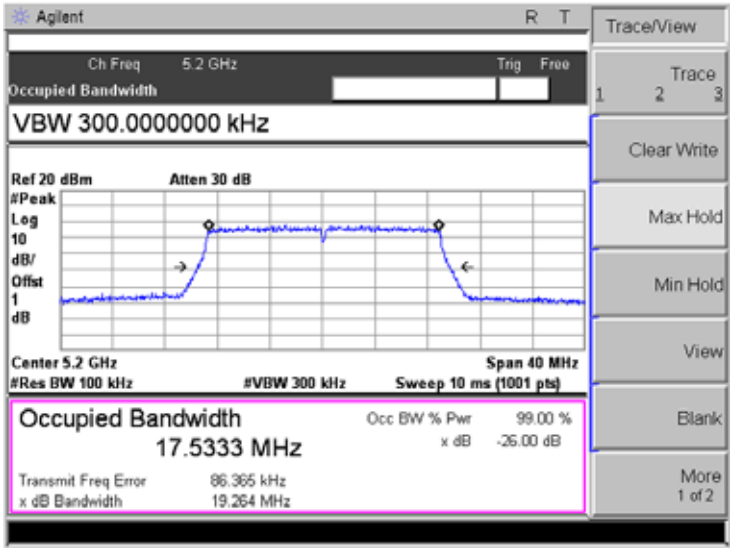
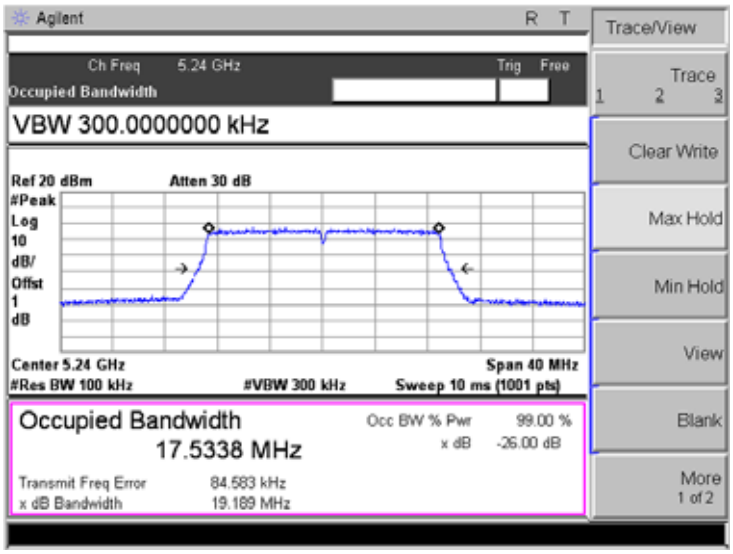
Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

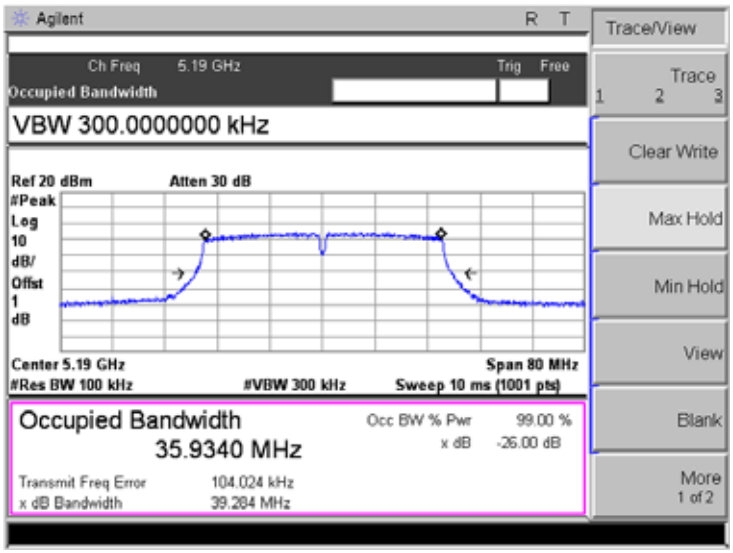
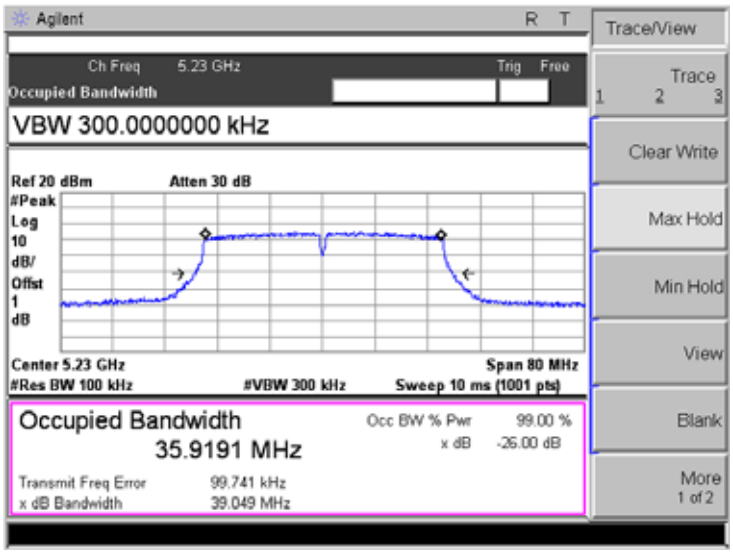
Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

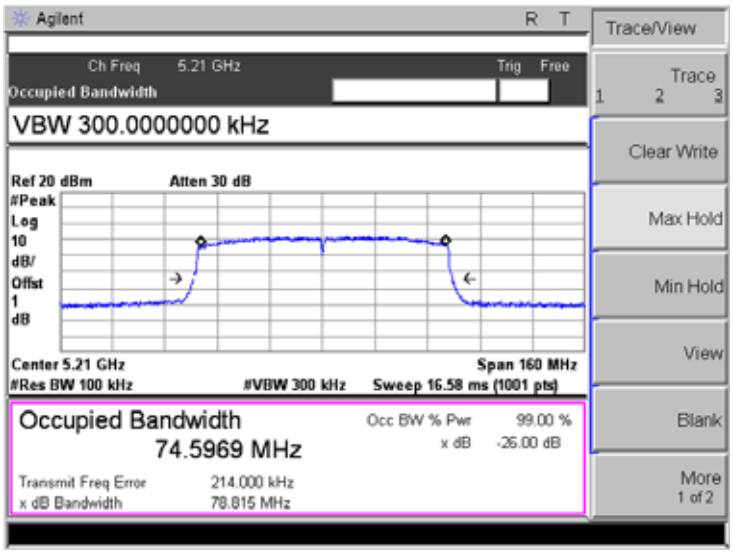
Mode:	802.11ac VH80
5775 MHz	

➢ Antenna 1: 5150-5250MHz

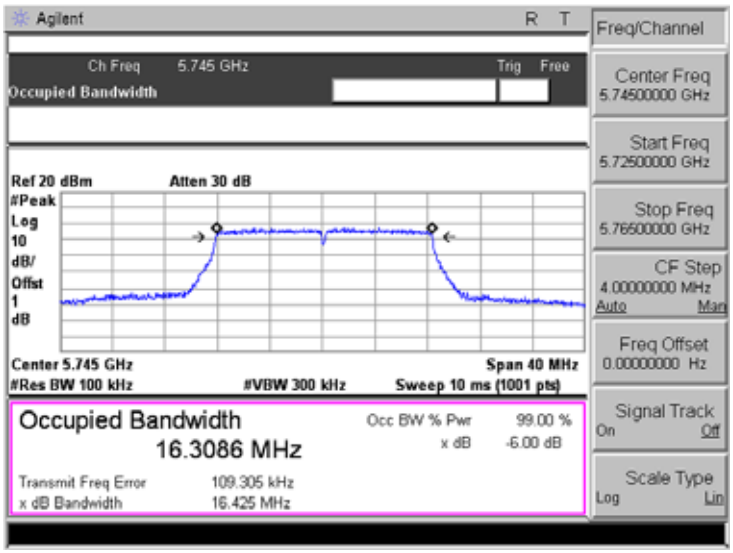
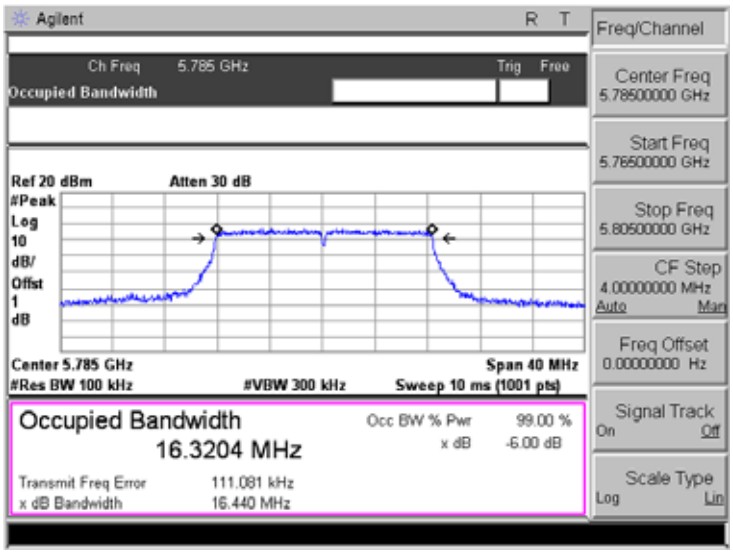
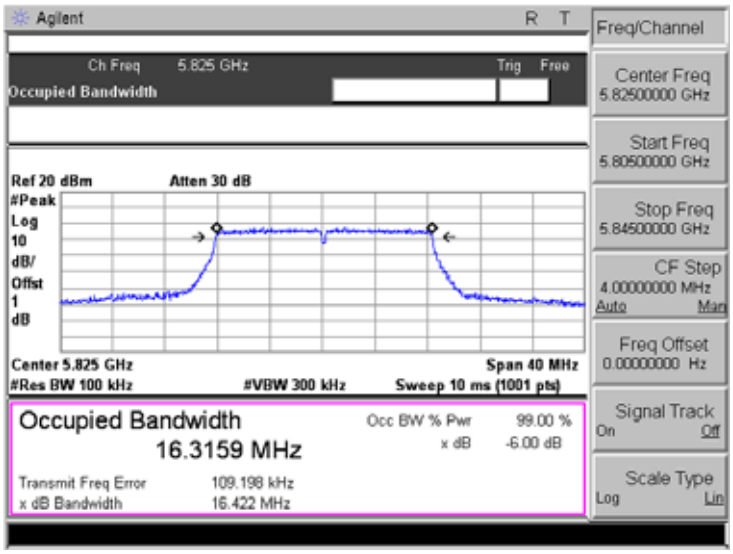
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

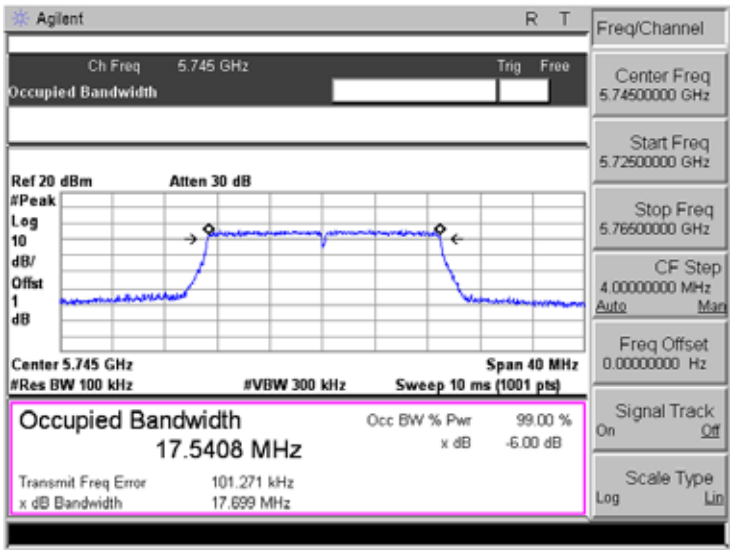
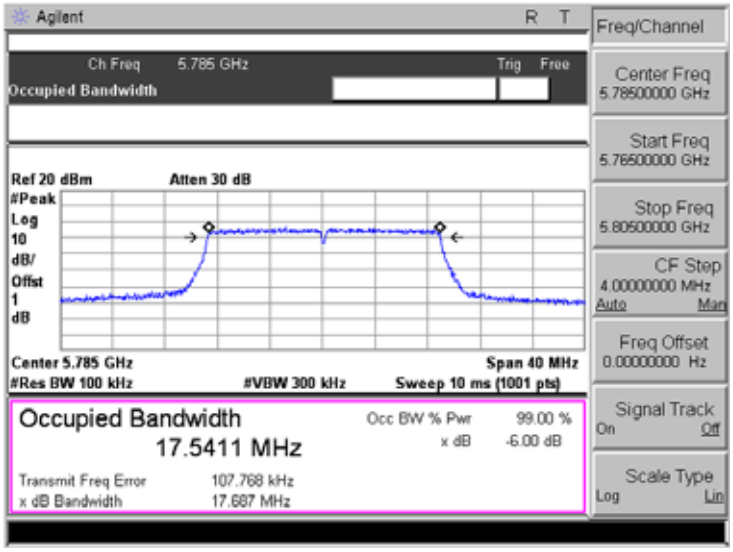
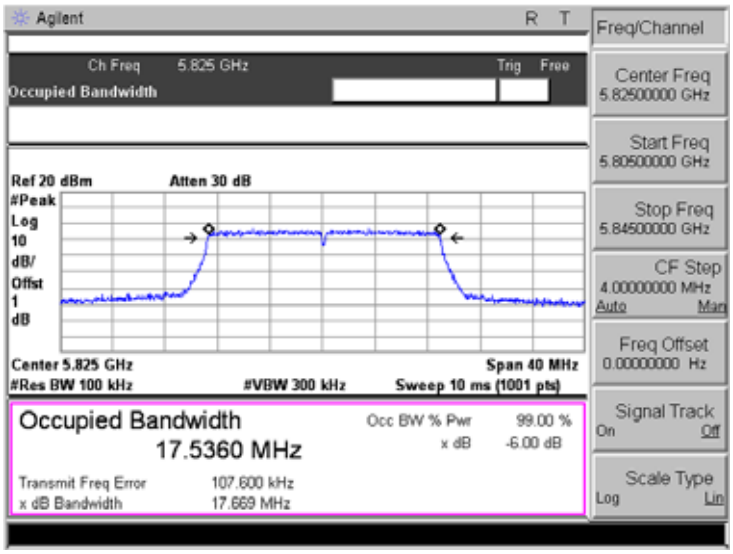
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

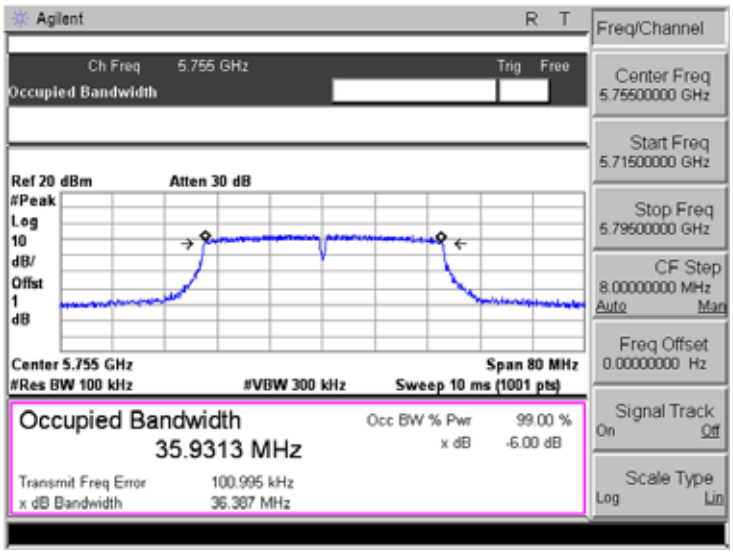
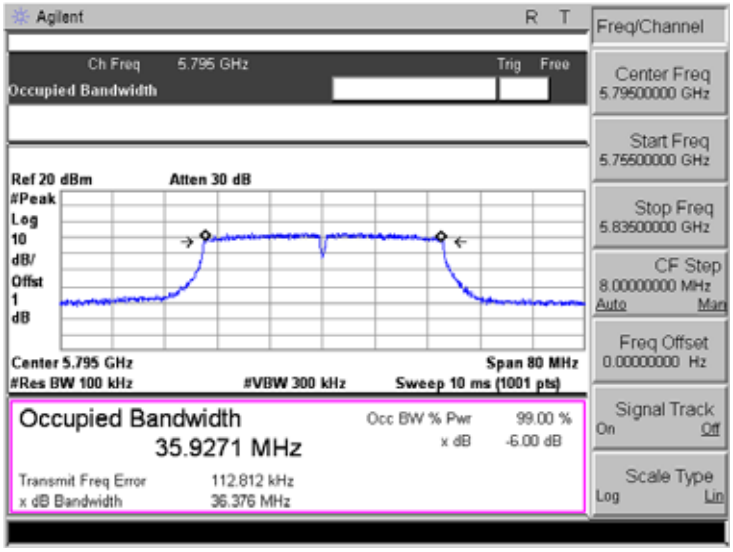
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

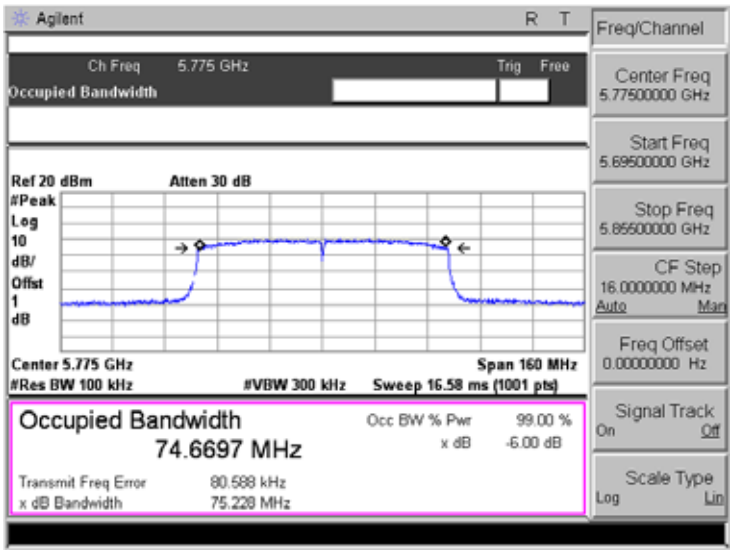
Mode:	802.11ac VH80
5210MHz	

➢ Antenna B: 5725-5850MHz

Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

8. Maximum Conducted Output Power

8.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

8.2 Test Procedure

According to KDB789033 D02 v02r01 section E, the following is the measurement procedure.

(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

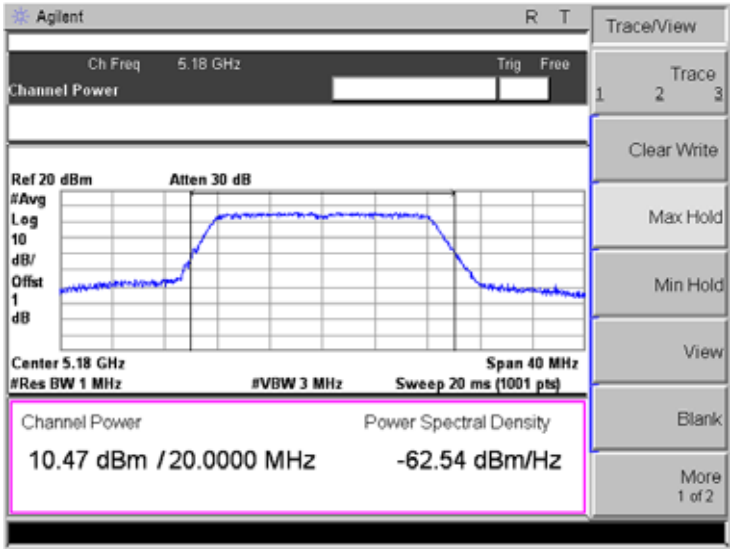
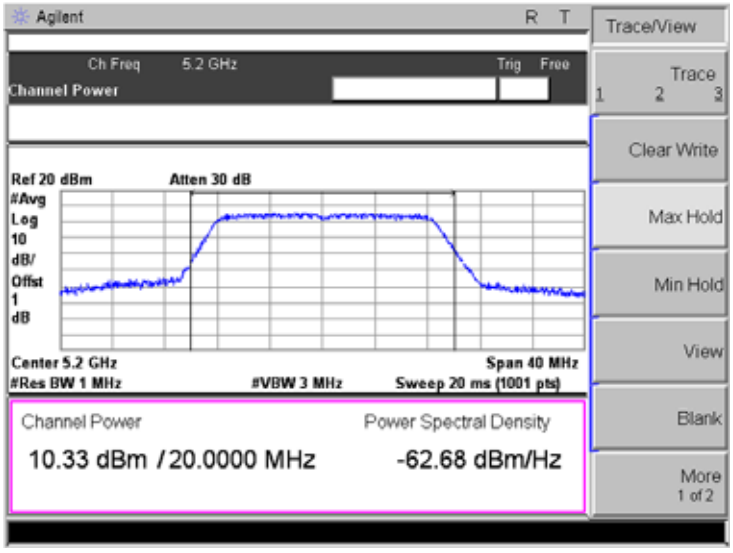
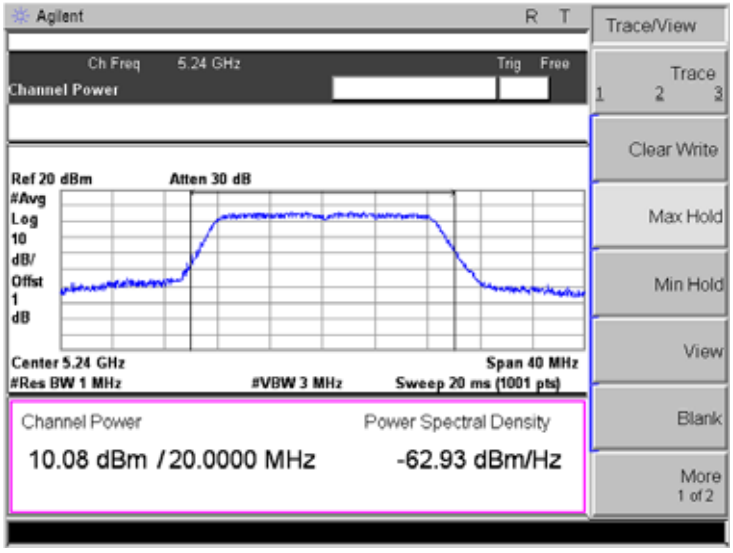
(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

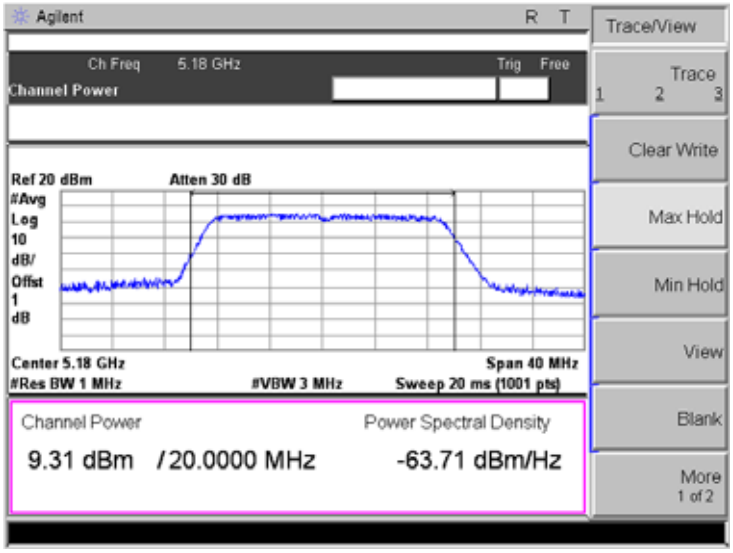
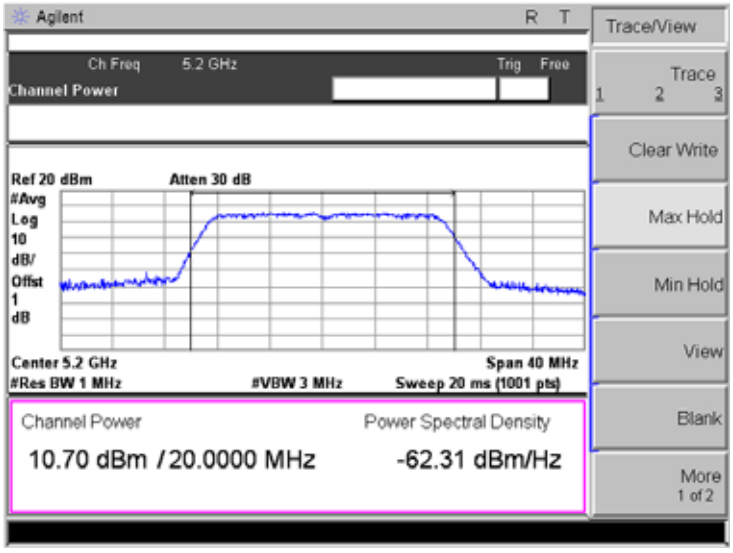
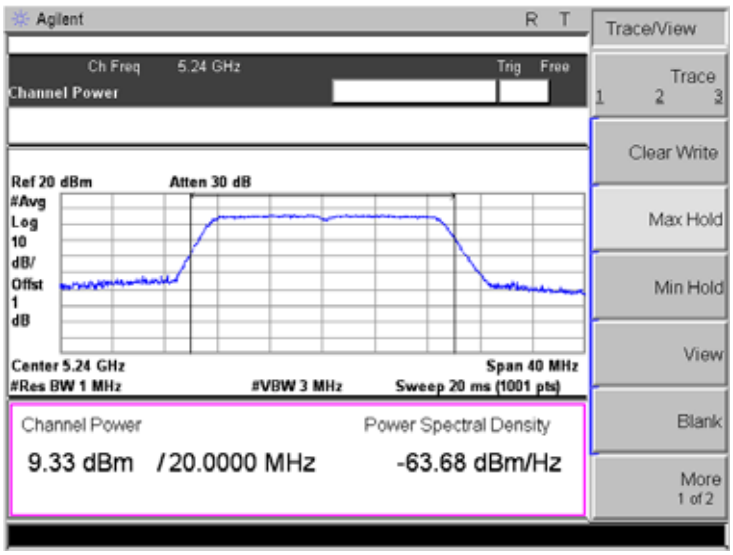
8.3 Summary of Test Results/Plots

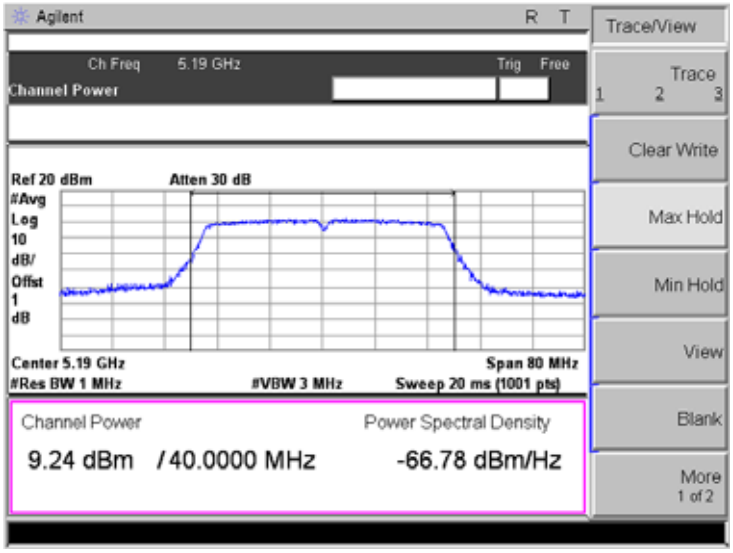
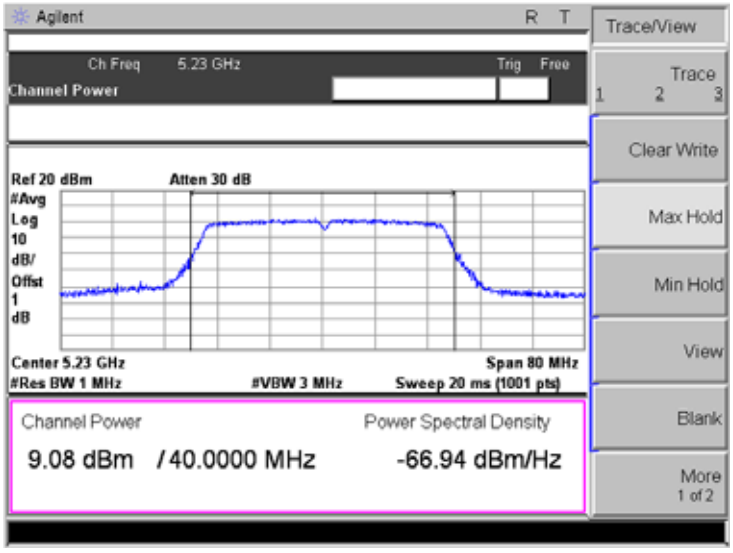
U-NII-1:5150-5250MHz								
Test mode	Frequency MHz	ANT A Power dBm	ANT B Power dBm	ANT A Power mW	ANT B Power mW	Total Power dBm	Output Power mW	Limit mW
802.11a	5180	10.47	10.95	11.14	12.45	/	/	250
	5200	10.33	10.58	10.79	11.43	/	/	250
	5240	10.08	10.70	10.19	11.75	/	/	250
802.11n-HT20	5180	9.31	10.55	8.53	11.35	12.98	19.88	250
	5200	10.70	10.70	11.75	11.75	13.71	23.50	250
	5240	9.33	10.20	8.57	10.47	12.80	19.04	250
802.11n-HT40	5190	9.24	10.67	8.39	11.67	13.02	20.06	250
	5230	9.08	10.69	8.09	11.72	12.97	19.81	250
802.11ac VH80	5210	8.58	10.60	7.21	11.48	12.72	18.69	250

U-NII-3: 5725-5850MHz								
Test mode	Frequency MHz	ANT A Power dBm	ANT B Power dBm	ANT A Power mW	ANT B Power mW	Total Power dBm	Output Power mW	Limit mW
802.11a	5745	9.80	10.41	9.55	10.99	/	/	250
	5785	9.78	9.94	9.51	9.86	/	/	250
	5825	10.23	10.61	10.54	11.51	/	/	250
802.11n-HT20	5745	9.48	10.72	8.87	11.80	13.15	20.67	250
	5785	9.96	9.41	9.91	8.73	12.70	18.64	250
	5825	10.06	9.27	10.14	8.45	12.69	18.59	250
802.11n-HT40	5755	10.17	9.39	10.40	8.69	12.81	19.09	250
	5795	9.20	9.54	8.32	8.99	12.38	17.31	250
802.11ac VH80	5775	9.59	9.32	9.10	8.55	12.47	17.65	250

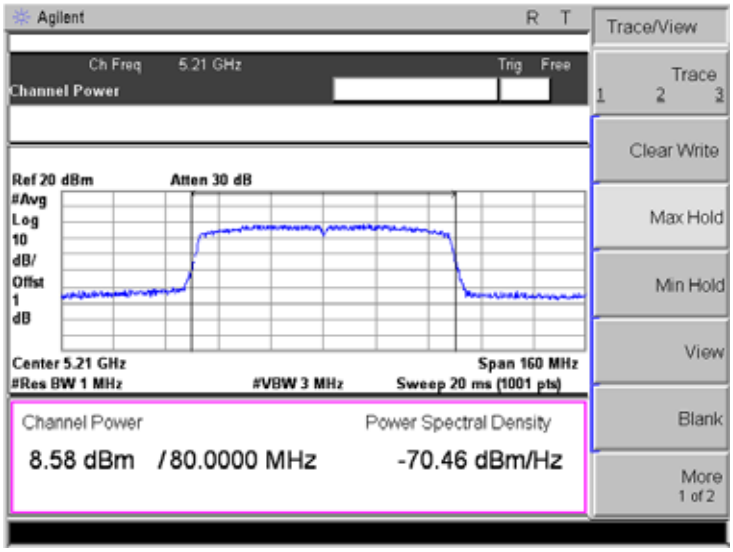
- Antenna A: 5150-5250MHz

Mode:	802.11a
5180MHz	
5200MHz	
5240MHz	

Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

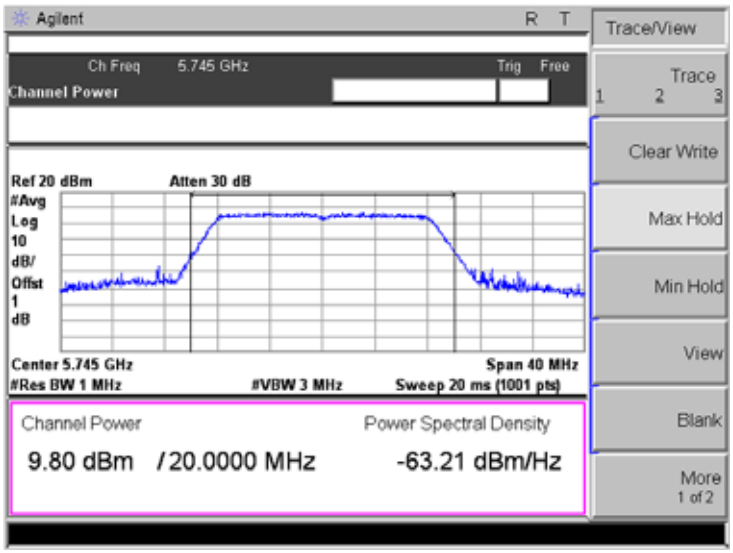
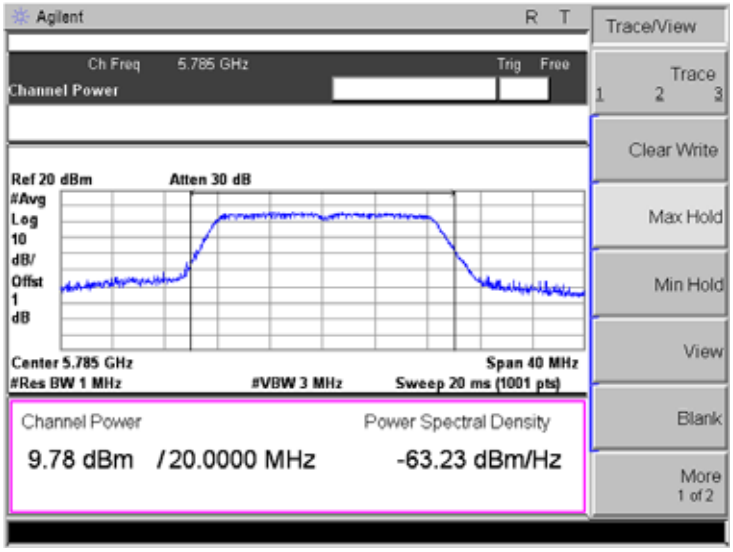
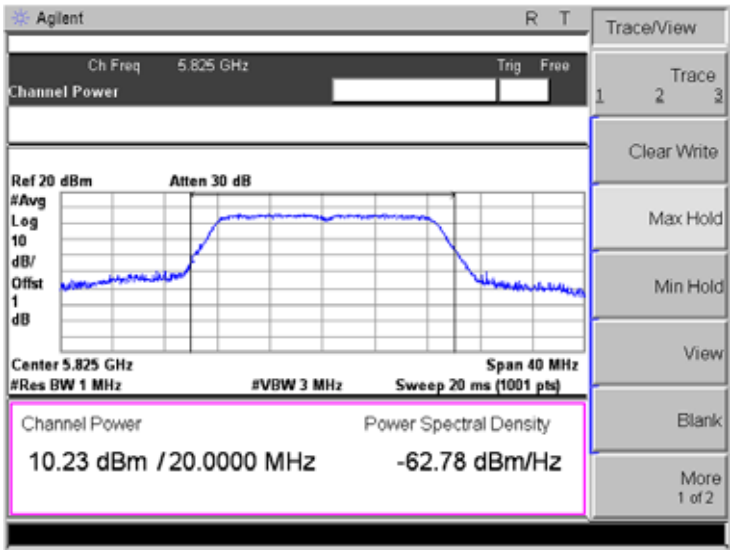
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

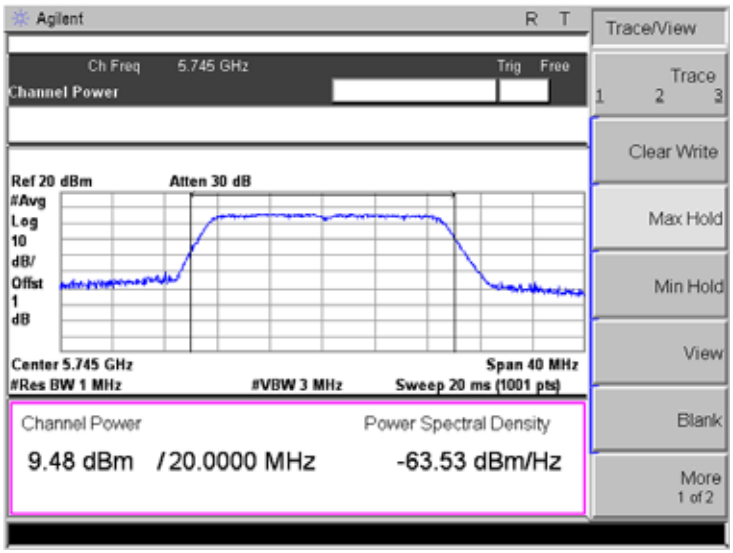
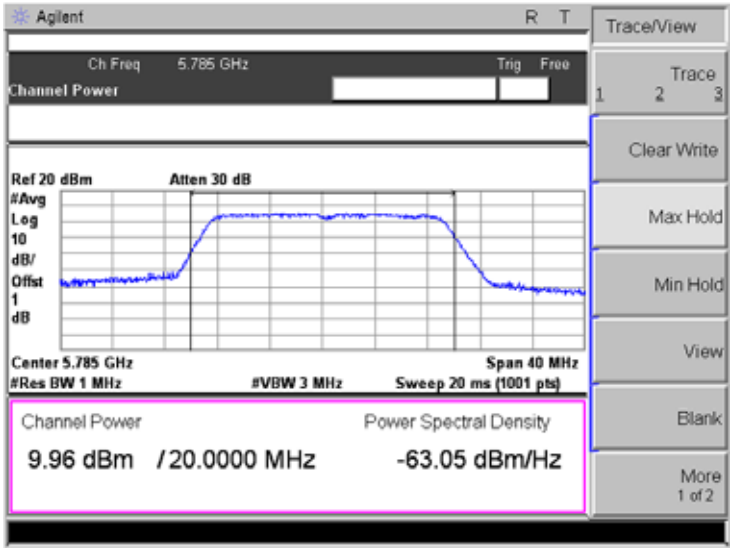
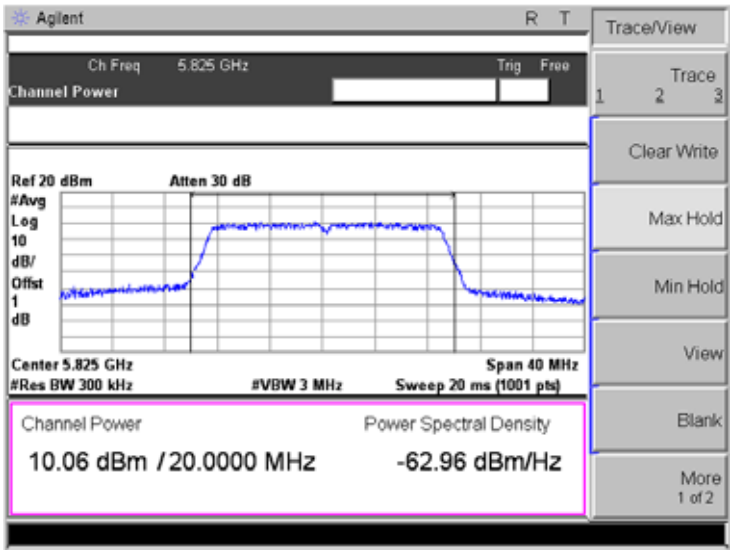
Mode:	**802.11ac VH80**

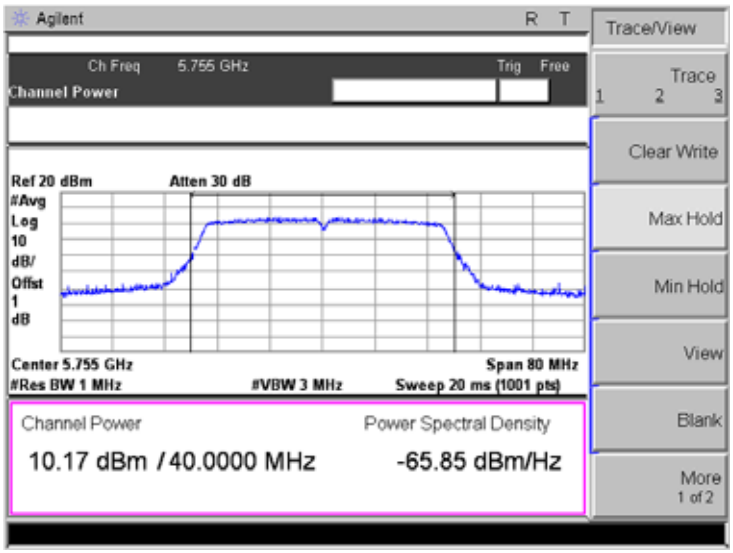
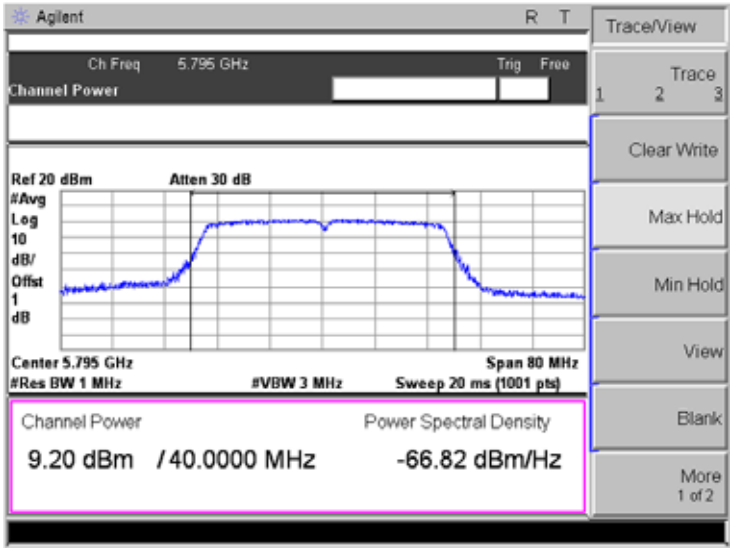
5210MHz	

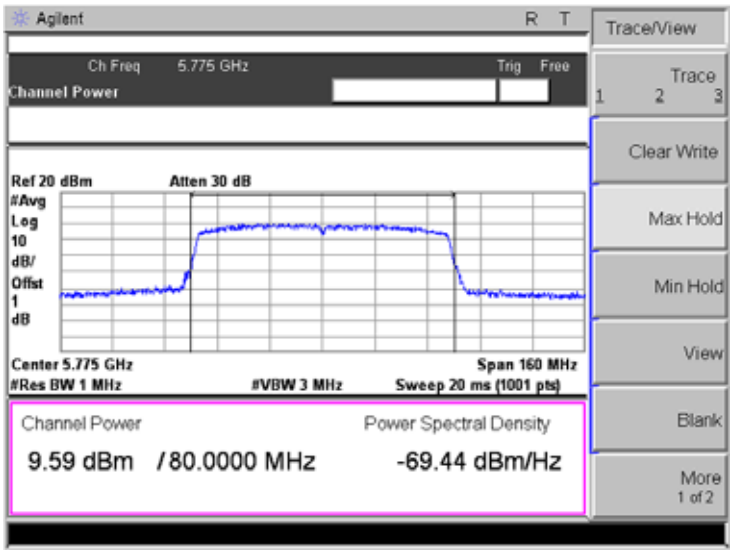
Agilent
R T
Ch Freq 5.21 GHz
Trig Free
Channel Power
Ref 20 dBm
Atten 30 dB
#Avg
Log
10
dB/
Offst
1
dB
Center 5.21 GHz
Span 160 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 20 ms (1001 pts)
Channel Power
8.58 dBm
/80.0000 MHz
Power Spectral Density
-70.46 dBm/Hz
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

➢ Antenna A: 5725-5850MHz

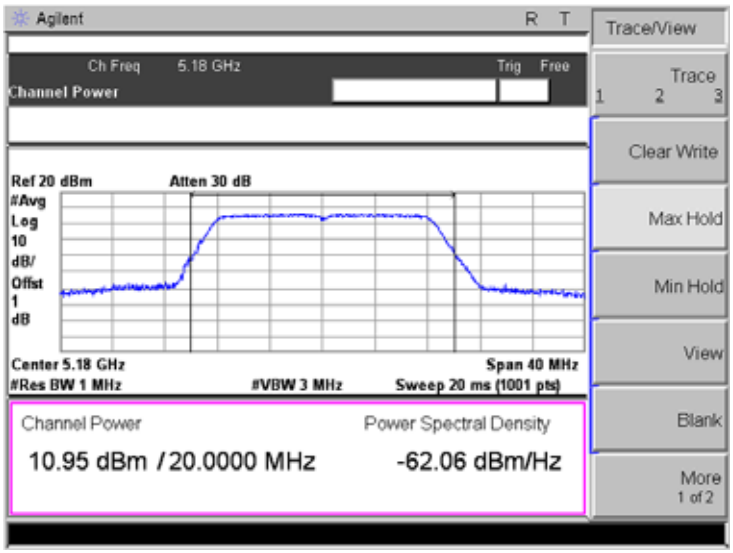
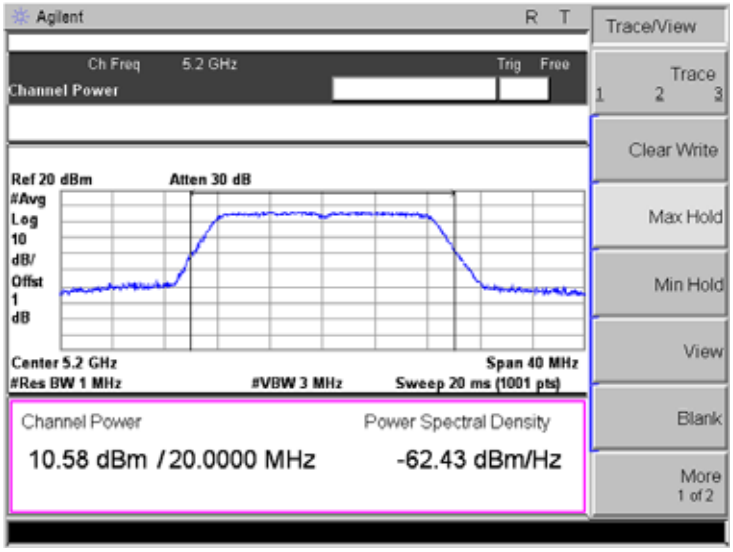
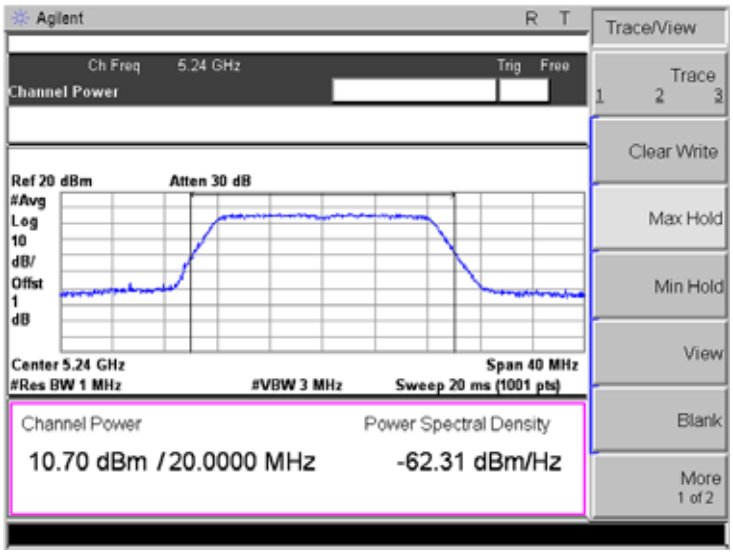
Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

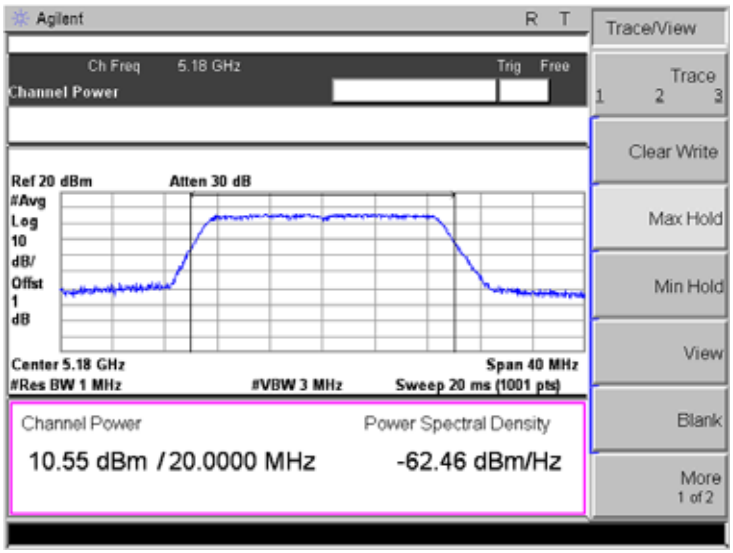
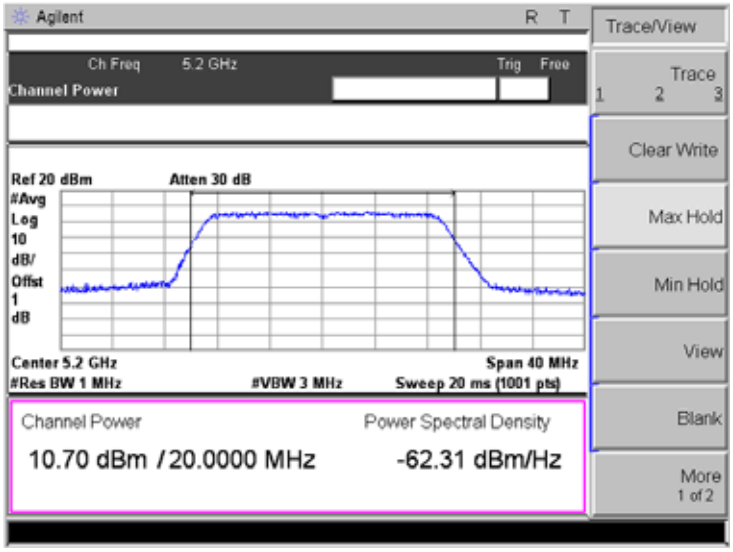
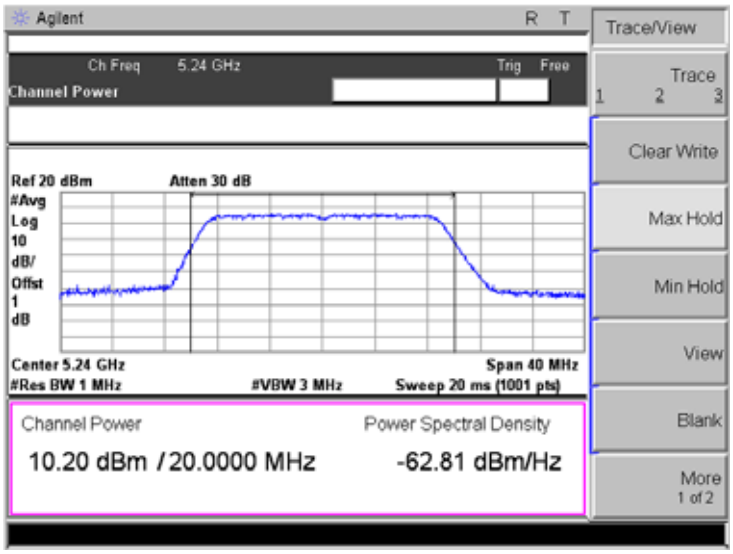
Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

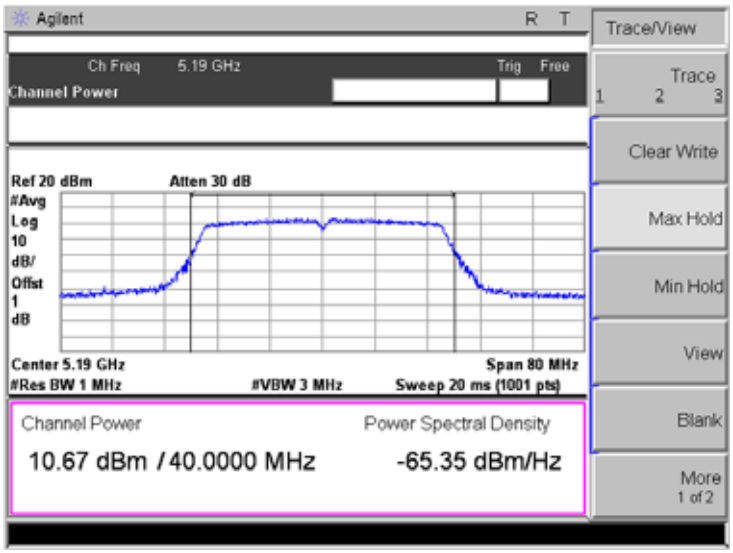
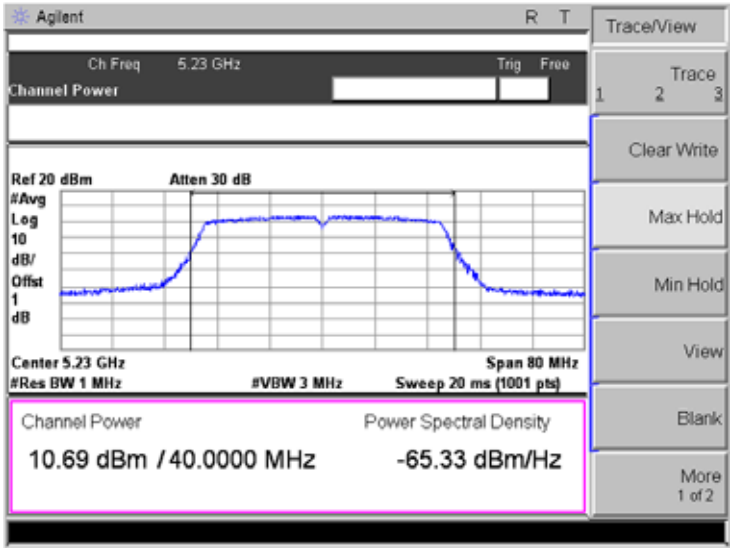
Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

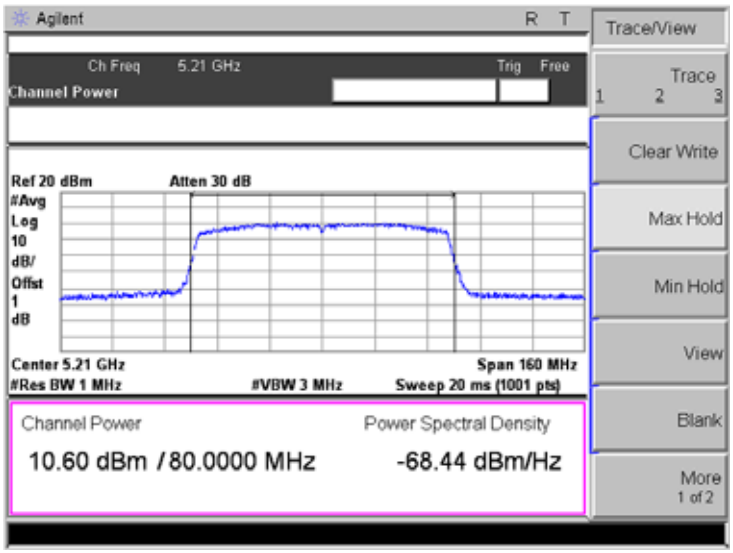
Mode:	802.11ac VH80
5775 MHz	

➢ Antenna B: 5150-5250MHz

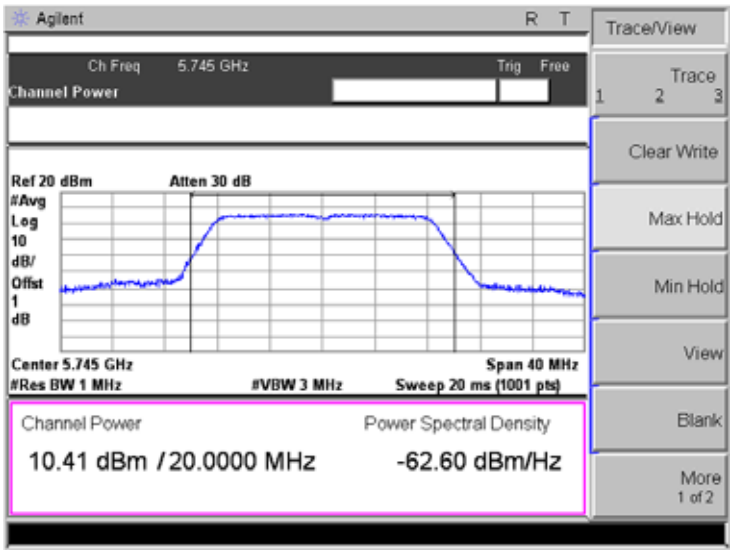
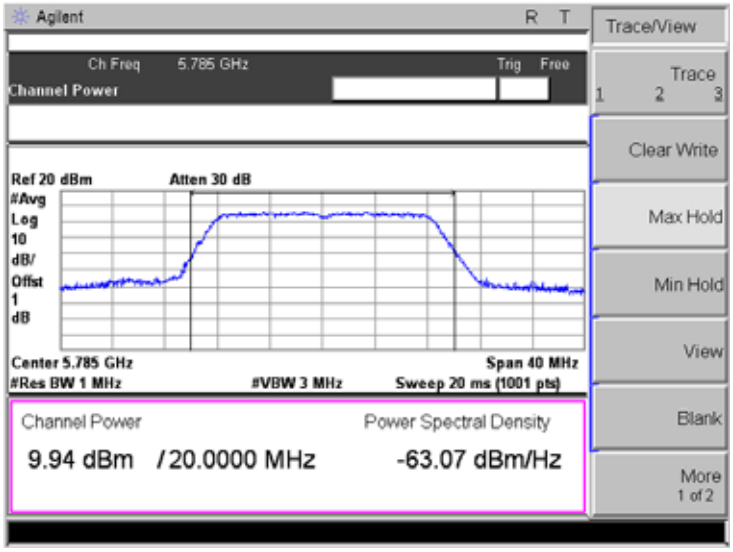
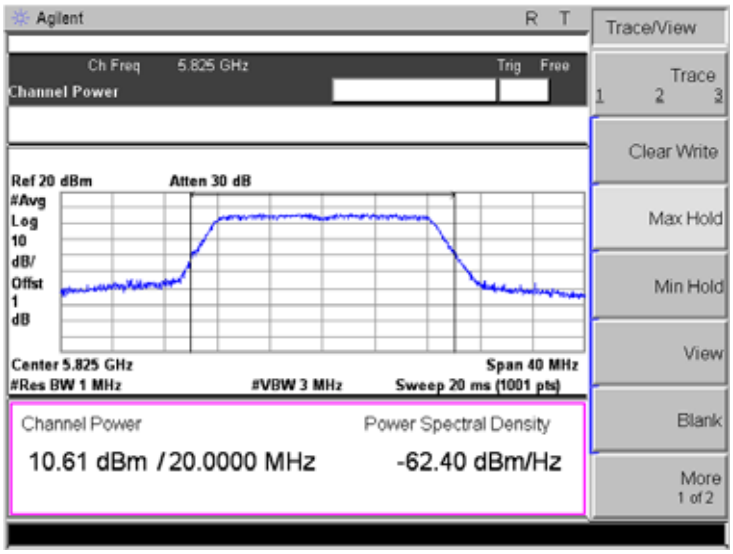
Mode:	**802.11a**
5180MHz	
5200MHz	
5240MHz	

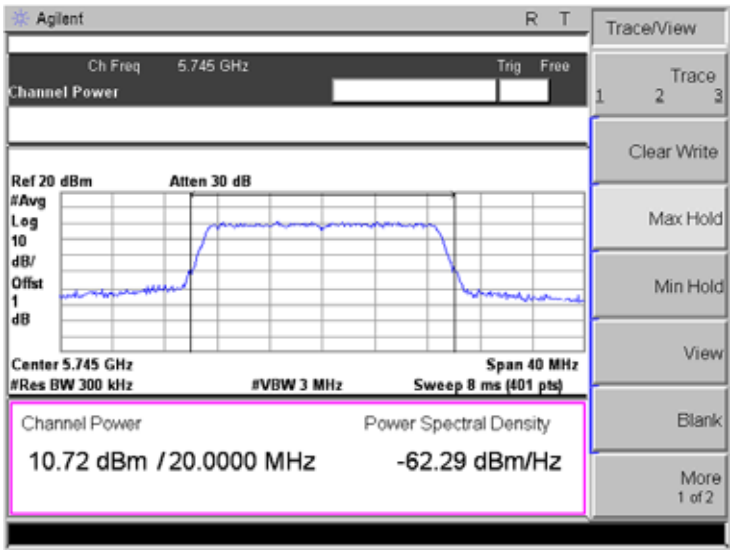
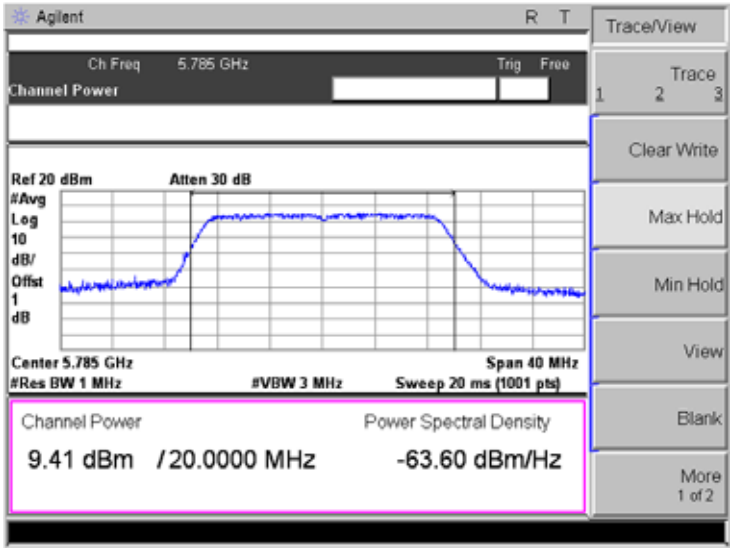
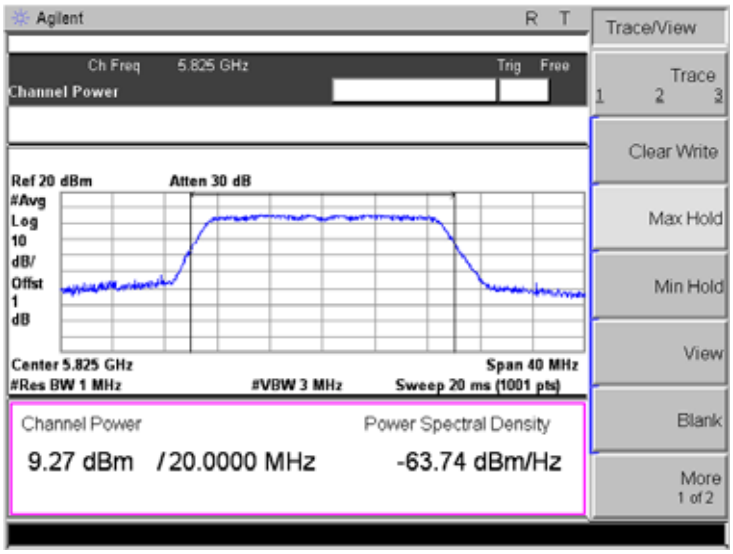
Mode:	802.11n-HT20
5180MHz	
5200MHz	
5240MHz	

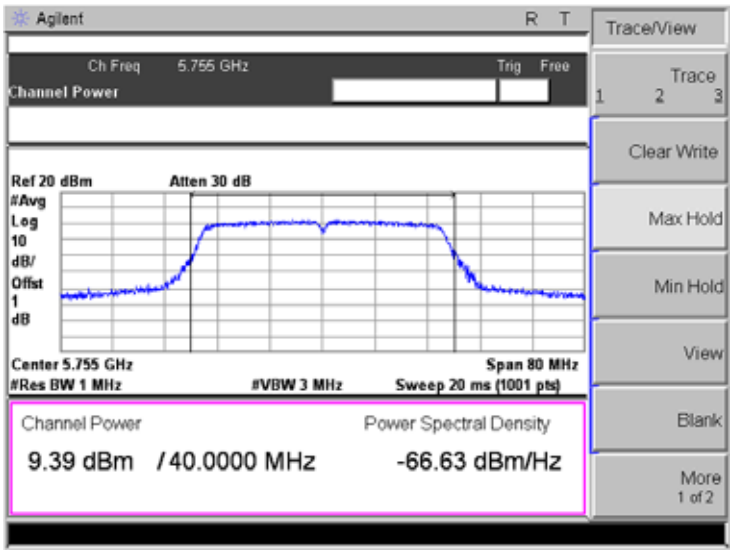
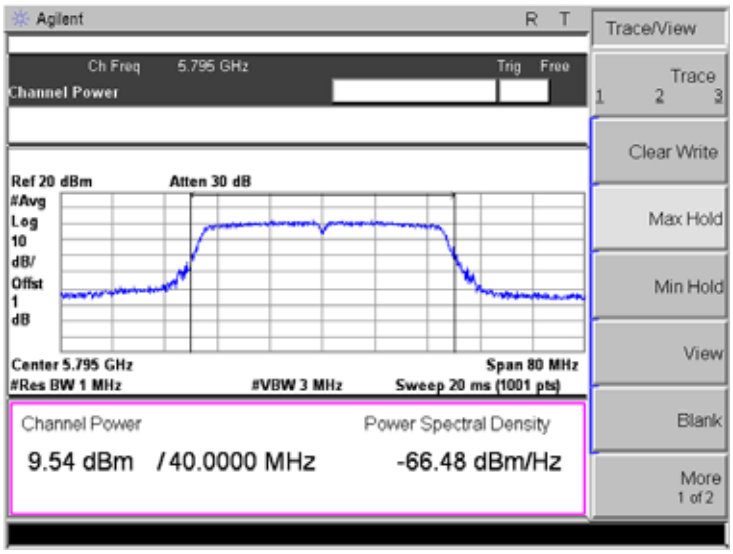
Mode:	802.11n-HT40
5190 MHz	
5230 MHz	

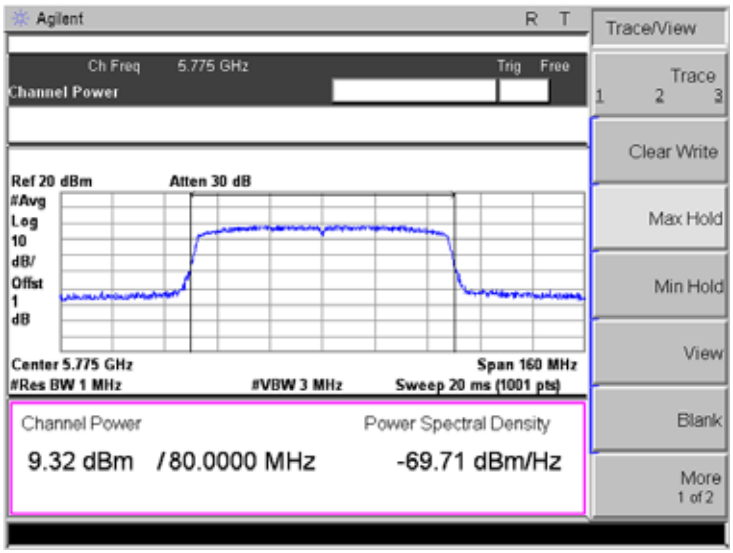
Mode:	802.11ac VH80
5210MHz	

➢ Antenna B: 5725-5850MHz

Mode:	802.11a
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT20
5745MHz	
5785MHz	
5825MHz	

Mode:	802.11n-HT40
5755 MHz	
5795 MHz	

Mode:	802.11ac VH80
5775 MHz	

9. Radiated Spurious Emissions

9.1 Standard Applicable

According to §15.407(b), undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

According to §15.407(b)(6), Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

According to §15.407(b)(7), The provisions of §15.205 apply to intentional radiators operating under this section.

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If radiated measurements are performed, field strength is then converted to EIRP as follows:

EIRP = ((E*d)^2) / 30

where:

· E is the field strength in V/m;

· d is the measurement distance in meters;

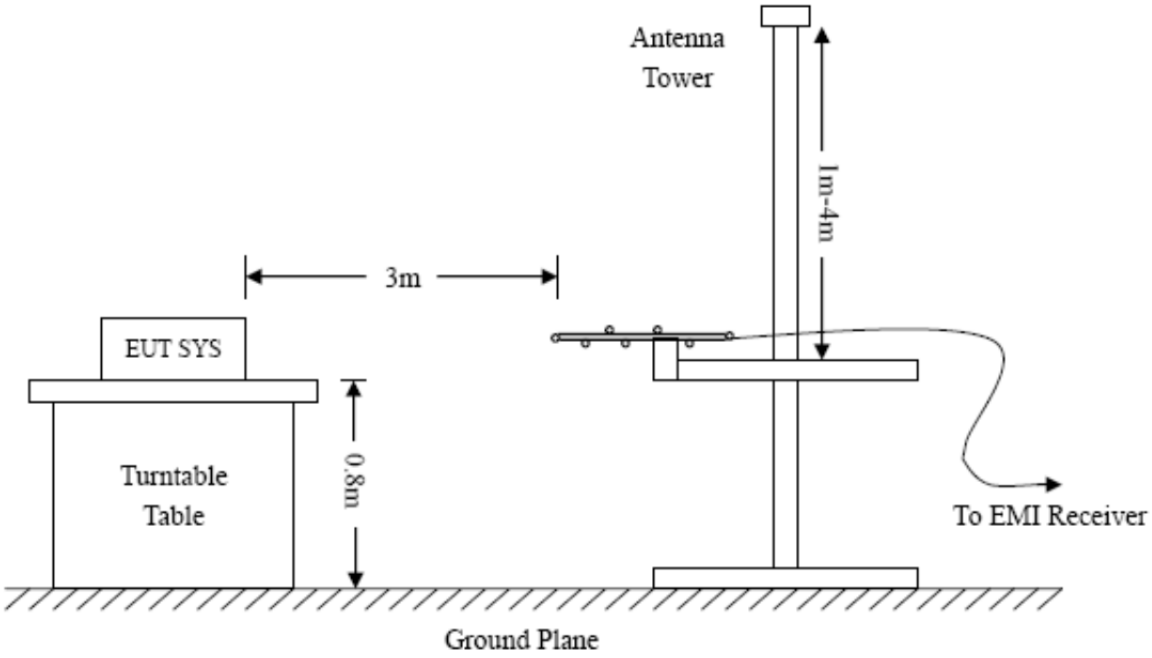
· EIRP is the equivalent isotropically radiated power in watts.

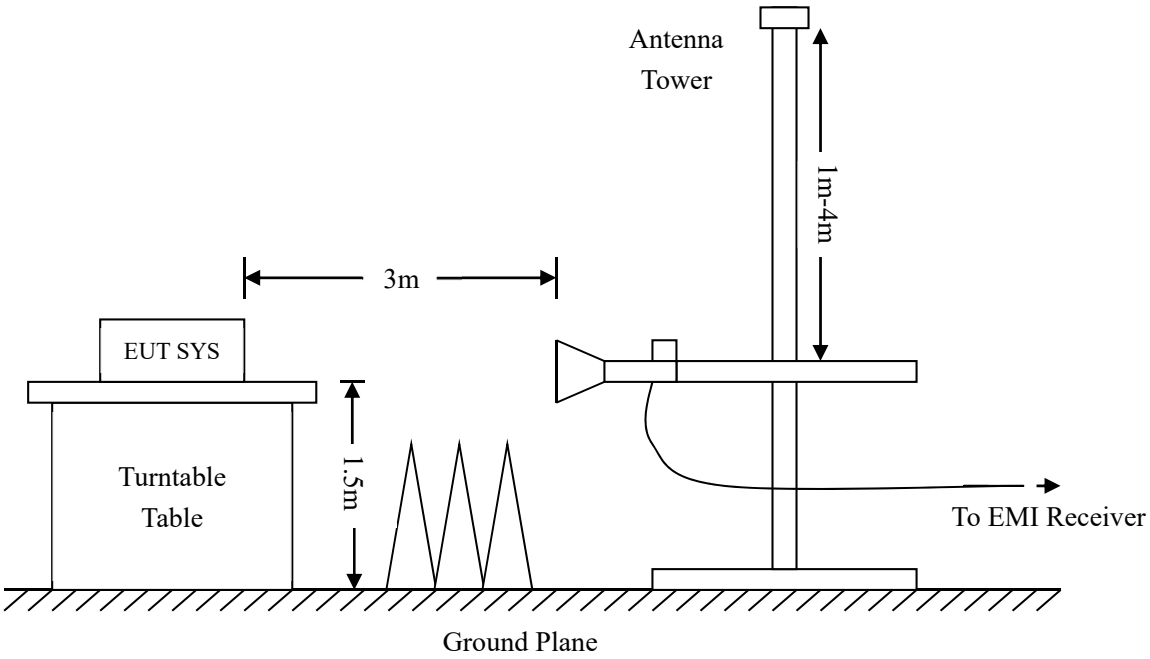
9.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.407(b)(6) and FCC Part 15.209 Limit..

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

The spacing between the peripherals was 10 cm.


Antenna
Tower
1m-4m
3m
EUT SYS
Turntable
Table
0.8m
To EMI Receiver
Ground Plane


Antenna
Tower
1m-4m
3m
EUT SYS
Turntable
Table
1.5m
To EMI Receiver
Ground Plane

9.3 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:
RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:
RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

9.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

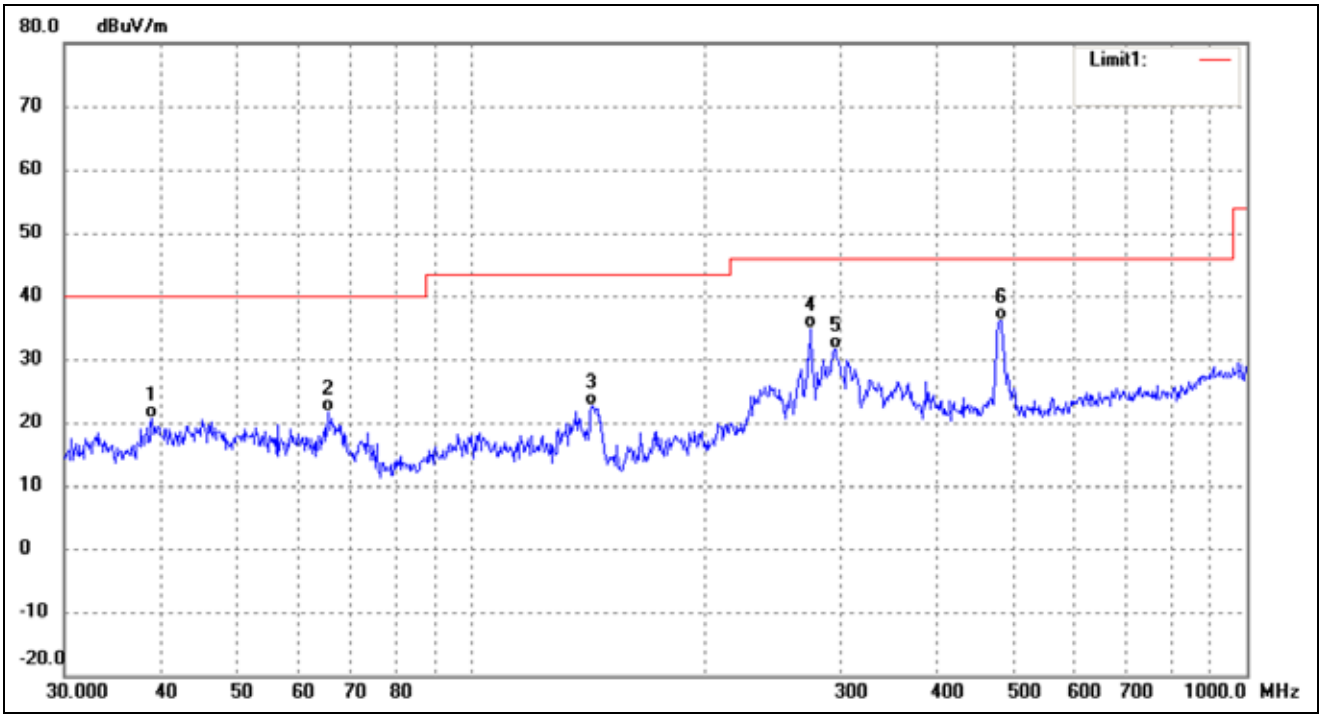
9.5 Summary of Test Results/Plots

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

- Spurious Emission From 30 MHz to 1 GHz

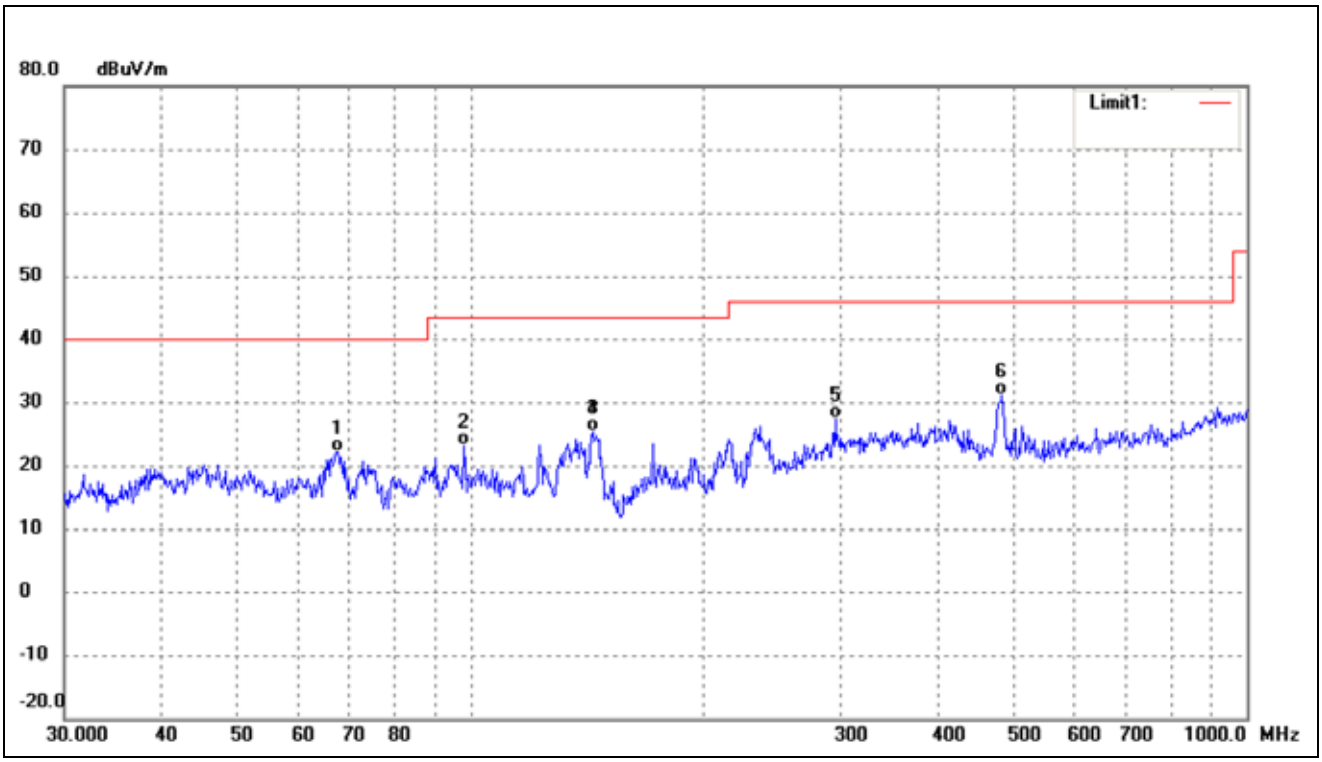
- Worst case Antenna B
- 5150-5250MHz

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



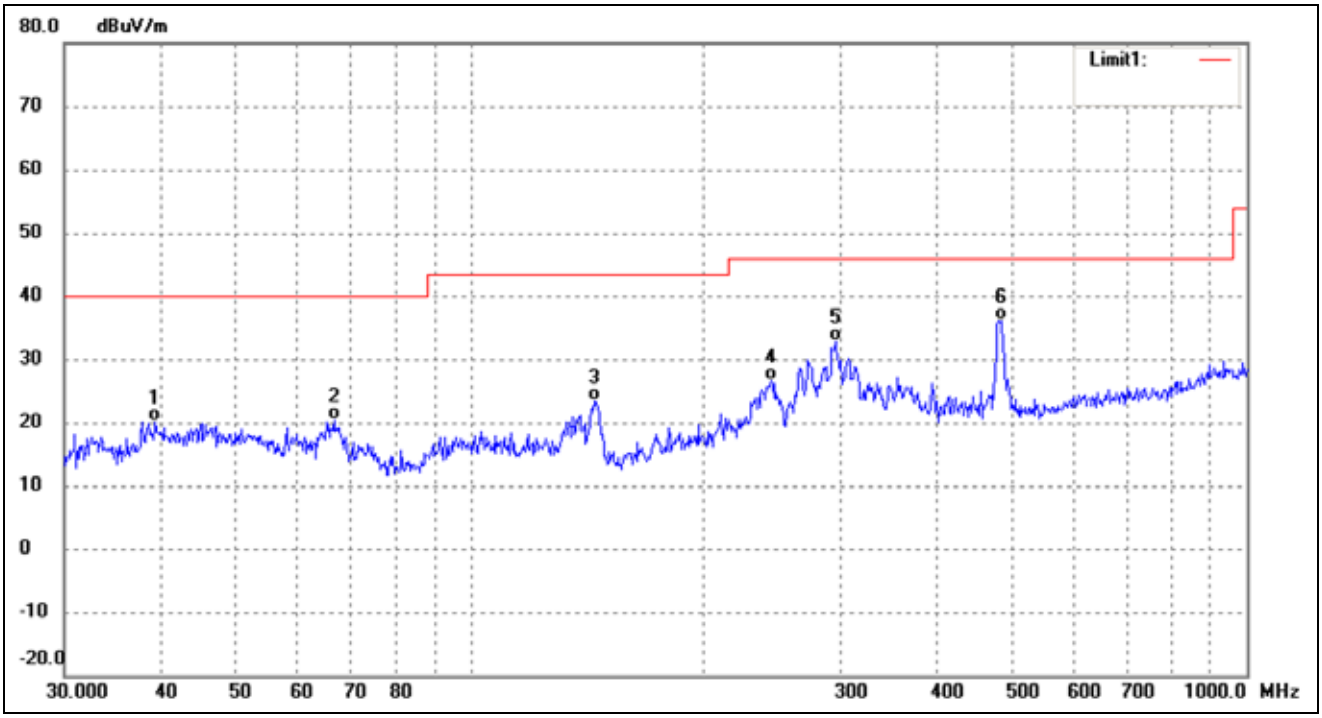
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	38.8879	35.25	-14.59	20.66	40.00	-19.34	QP
2	65.5727	37.87	-16.21	21.66	40.00	-18.34	QP
3	143.3261	39.71	-16.99	22.72	43.50	-20.78	QP
4	274.1939	44.90	-10.02	34.88	46.00	-11.12	QP
5	295.1469	39.86	-8.24	31.62	46.00	-14.38	QP
6	482.2156	44.23	-8.04	36.19	46.00	-9.81	QP

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



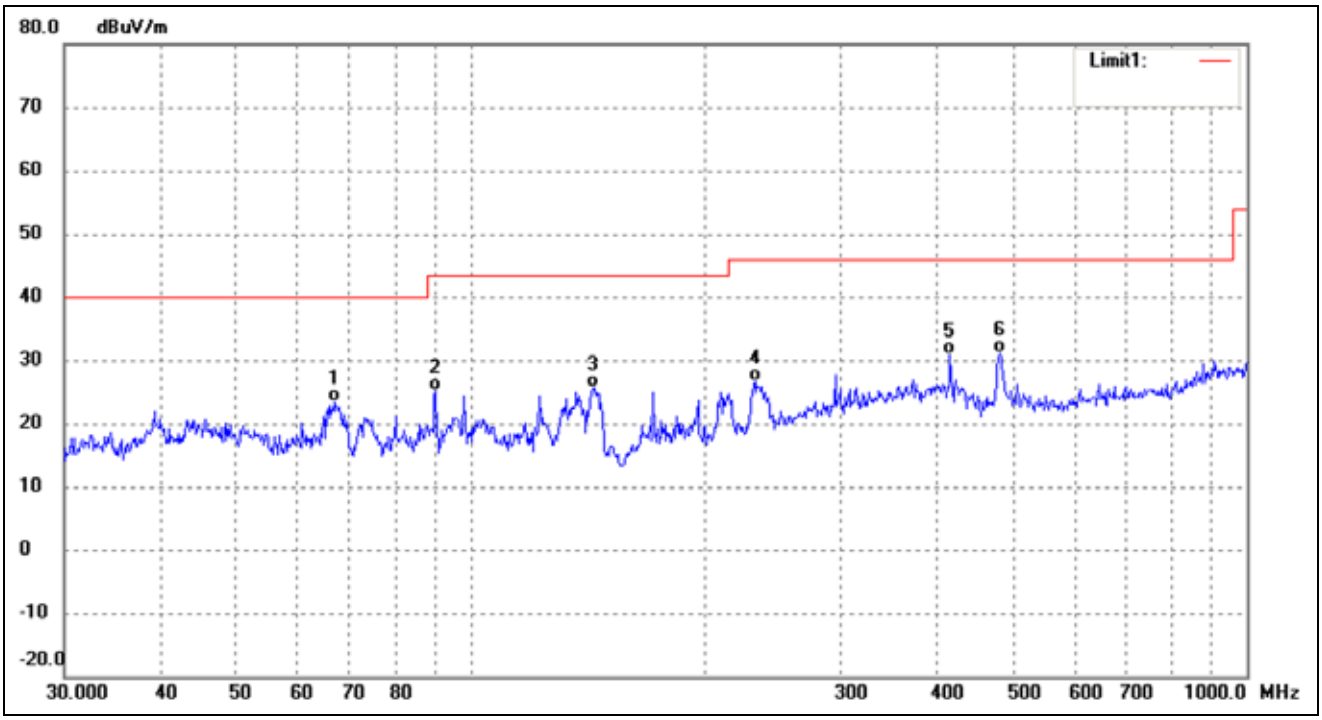
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	67.4382	38.72	-16.49	22.23	40.00	-17.77	QP
2	98.1419	38.45	-15.29	23.16	43.50	-20.34	QP
3	143.8295	42.33	-16.94	25.39	43.50	-18.11	QP
4	143.8295	42.33	-16.94	25.39	43.50	-18.11	QP
5	295.1469	35.73	-8.24	27.49	46.00	-18.51	QP
6	483.9094	39.04	-8.02	31.02	46.00	-14.98	QP

802.11n-HT40			
Test Channel	5190MHz(worst case)	Polarity:	Horizontal



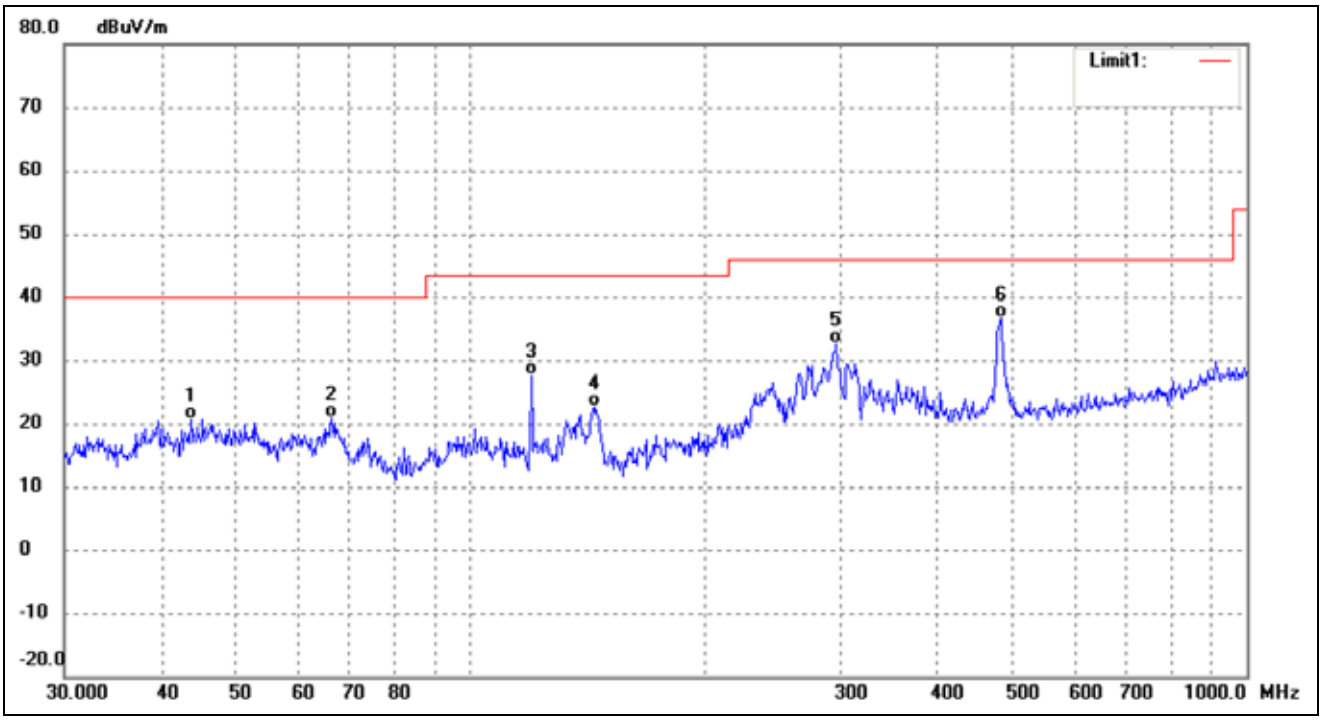
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	39.2991	34.67	-14.42	20.25	40.00	-19.75	QP
2	66.7325	36.72	-16.39	20.33	40.00	-19.67	QP
3	144.3348	40.28	-16.89	23.39	43.50	-20.11	QP
4	244.2321	37.45	-10.87	26.58	46.00	-19.42	QP
5	295.1469	41.03	-8.24	32.79	46.00	-13.21	QP
6	482.2156	44.26	-8.04	36.22	46.00	-9.78	QP

802.11n-HT40			
Test Channel	5190MHz(worst case)	Polarity:	Vertical



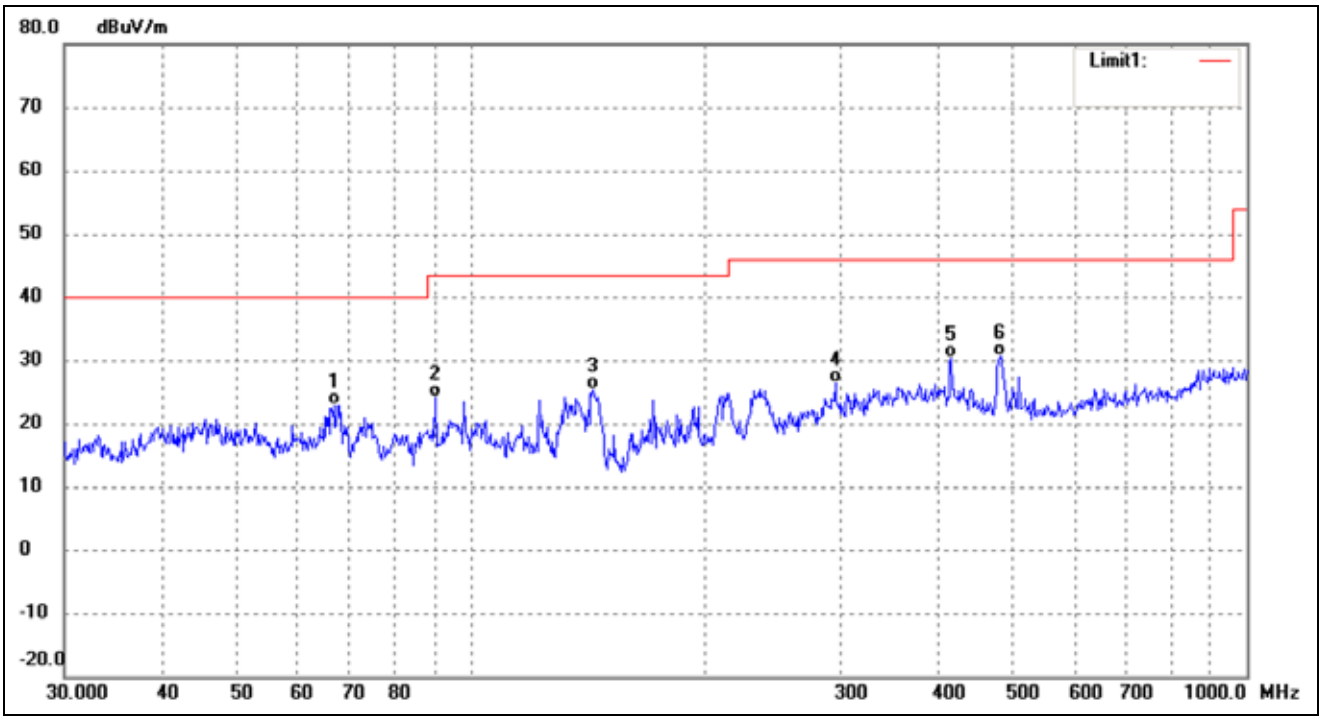
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	66.7325	39.71	-16.39	23.32	40.00	-16.68	QP
2	90.2205	41.99	-16.86	25.13	43.50	-18.37	QP
3	143.8295	42.58	-16.94	25.64	43.50	-17.86	QP
4	233.3487	38.11	-11.53	26.58	46.00	-19.42	QP
5	414.7223	38.65	-7.89	30.76	46.00	-15.24	QP
6	480.5276	39.09	-8.05	31.04	46.00	-14.96	QP

802.11ac-HT80			
Test Channel	5210MHz(worst case)	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	43.6585	34.59	-13.99	20.60	40.00	-19.40	QP
2	66.2662	37.28	-16.32	20.96	40.00	-19.04	QP
3	119.8556	43.14	-15.61	27.53	43.50	-15.97	QP
4	144.8418	39.49	-16.84	22.65	43.50	-20.85	QP
5	296.1836	40.77	-8.15	32.62	46.00	-13.38	QP
6	482.2156	44.63	-8.04	36.59	46.00	-9.41	QP

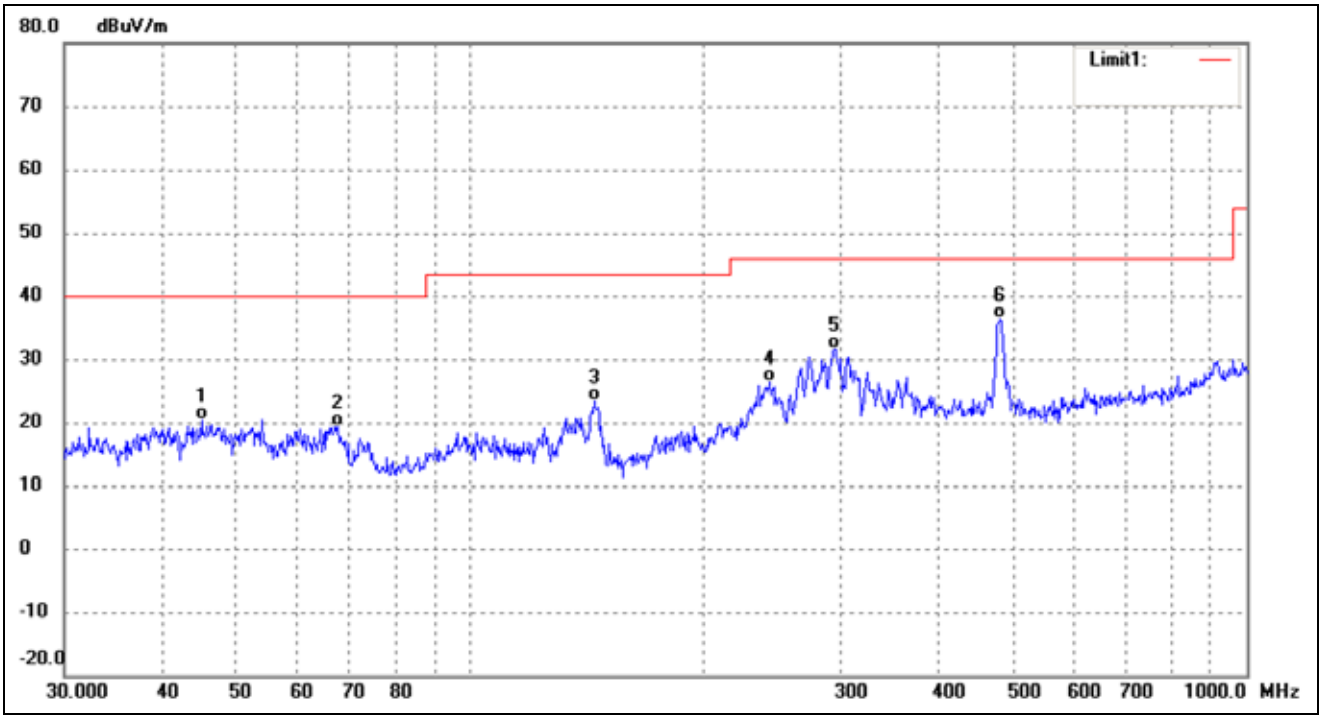
802.11ac-HT80			
Test Channel	5210MHz(worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	66.7325	39.23	-16.39	22.84	40.00	-17.16	QP
2	90.2205	41.02	-16.86	24.16	43.50	-19.34	QP
3	143.8295	42.37	-16.94	25.43	43.50	-18.07	QP
4	295.1469	34.70	-8.24	26.46	46.00	-19.54	QP
5	416.1791	38.18	-7.89	30.29	46.00	-15.71	QP
6	480.5276	38.76	-8.05	30.71	46.00	-15.29	QP

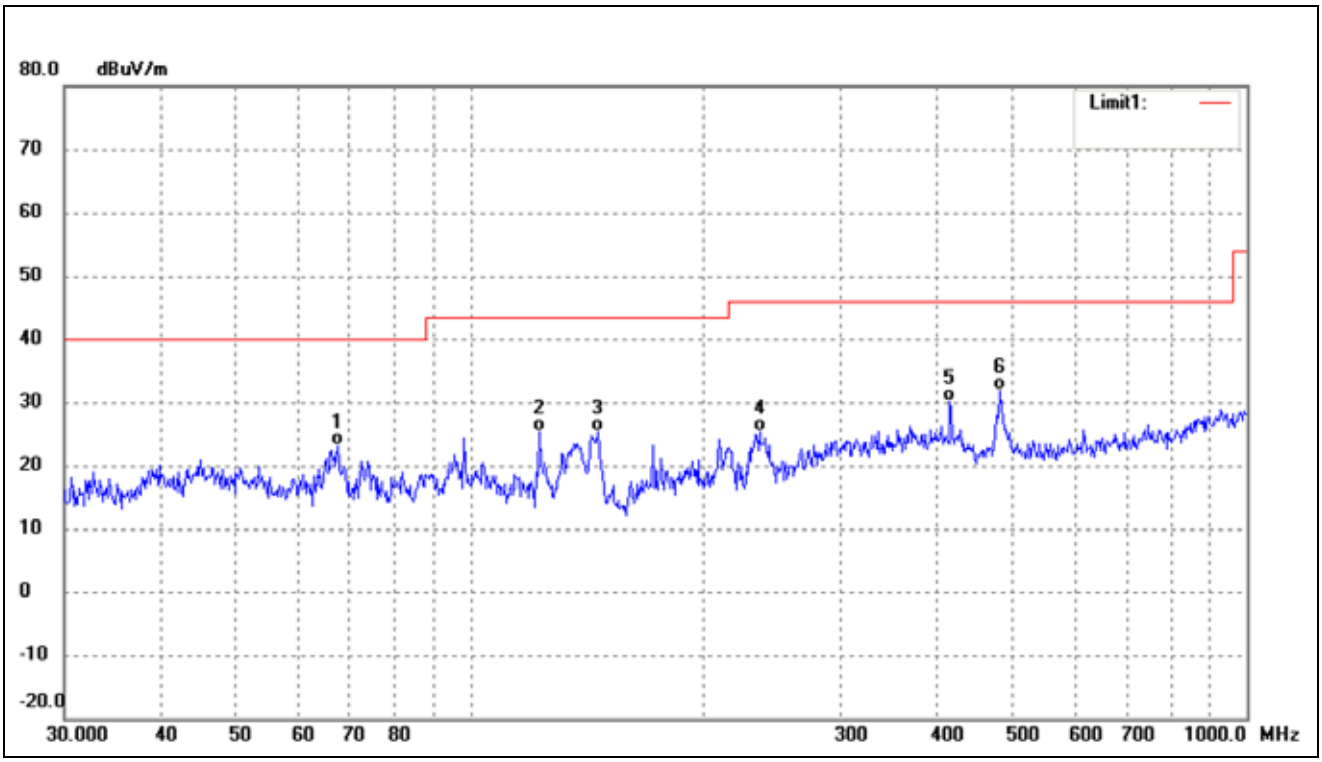
➢ Antenna B: 5725-5850MHz

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



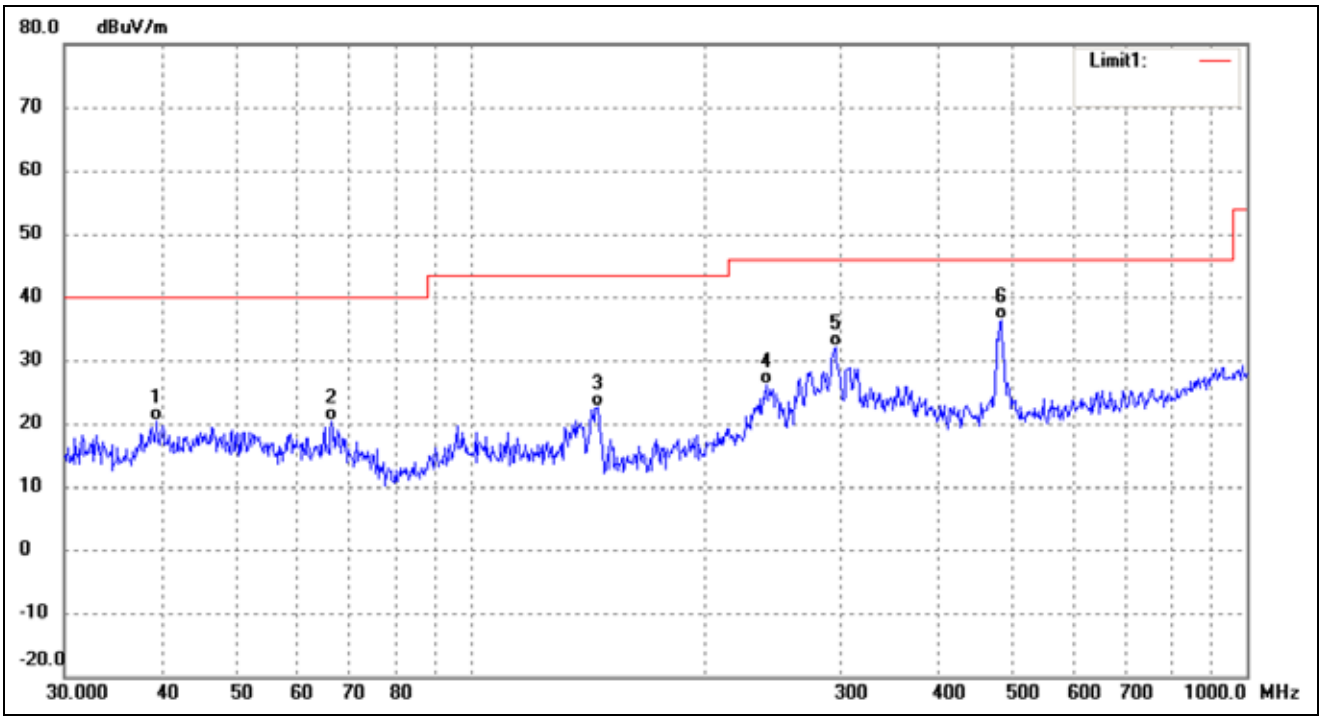
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	45.0583	34.23	-13.93	20.30	40.00	-19.70	QP
2	67.4382	35.93	-16.49	19.44	40.00	-20.56	QP
3	144.3348	40.23	-16.89	23.34	43.50	-20.16	QP
4	243.3772	37.25	-10.92	26.33	46.00	-19.67	QP
5	294.1137	40.02	-8.34	31.68	46.00	-14.32	QP
6	480.5276	44.42	-8.05	36.37	46.00	-9.63	QP

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



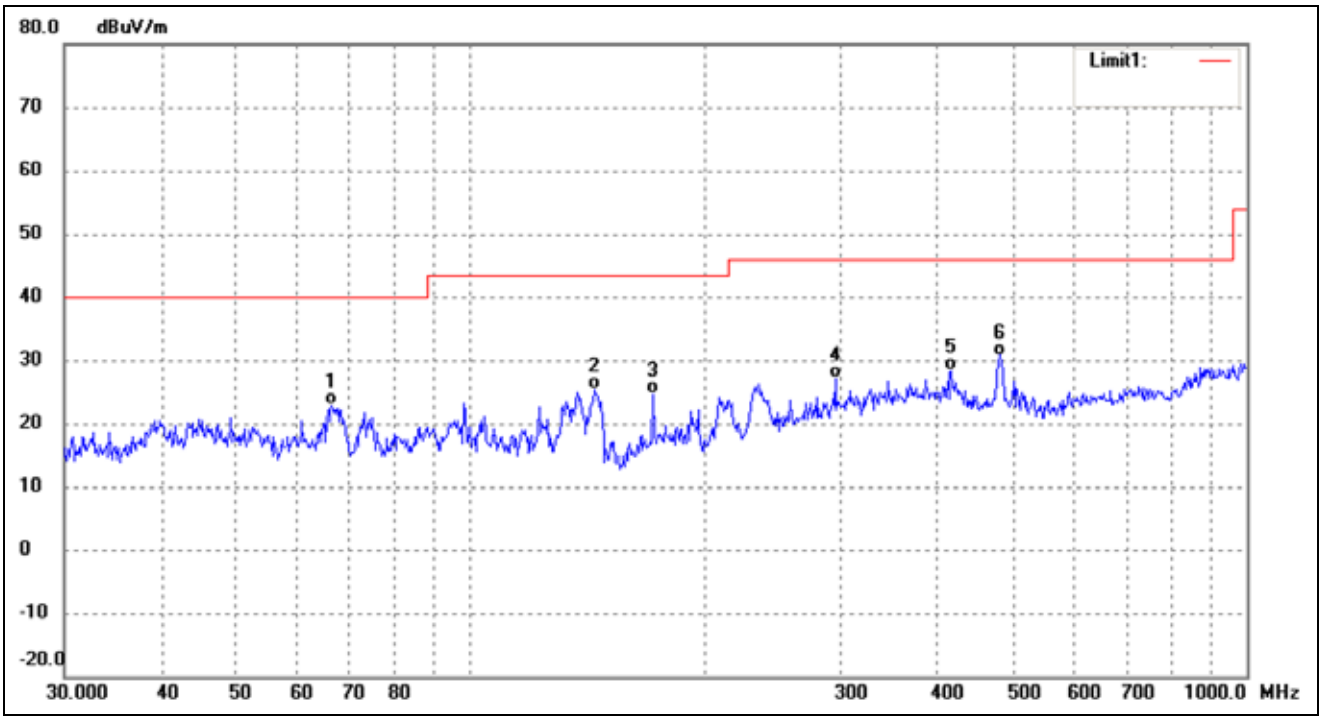
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	67.4382	39.51	-16.49	23.02	40.00	-16.98	QP
2	122.8340	41.73	-16.34	25.39	43.50	-18.11	QP
3	145.8611	42.23	-16.75	25.48	43.50	-18.02	QP
4	235.8164	36.85	-11.38	25.47	46.00	-20.53	QP
5	414.7223	38.05	-7.89	30.16	46.00	-15.84	QP
6	480.5276	39.82	-8.05	31.77	46.00	-14.23	QP

802.11ac-HT80			
Test Channel	5775MHz(worst case)	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	39.4372	34.70	-14.37	20.33	40.00	-19.67	QP
2	66.2662	36.71	-16.32	20.39	40.00	-19.61	QP
3	145.8611	39.48	-16.75	22.73	43.50	-20.77	QP
4	240.8304	37.18	-11.07	26.11	46.00	-19.89	QP
5	295.1469	40.33	-8.24	32.09	46.00	-13.91	QP
6	482.2156	44.31	-8.04	36.27	46.00	-9.73	QP

802.11ac-HT80			
Test Channel	5775MHz(worst case)	Polarity:	Vertical



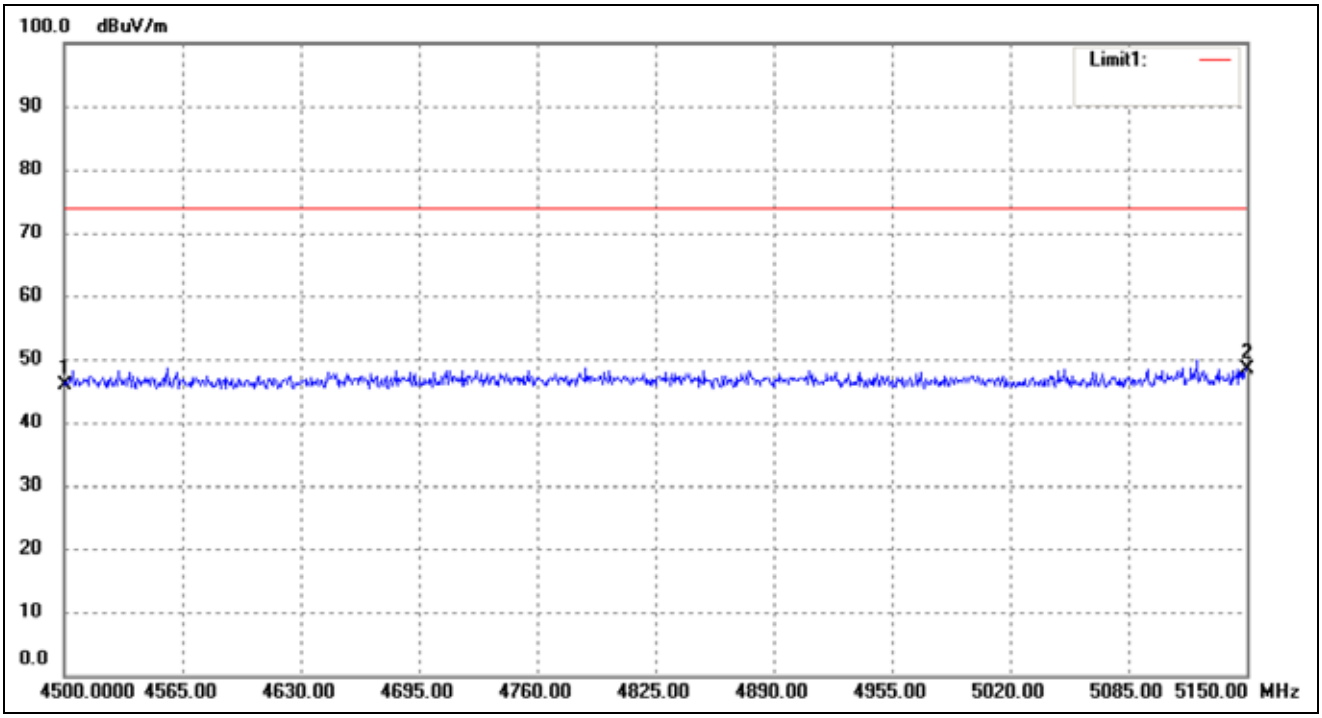
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	66.2662	39.18	-16.32	22.86	40.00	-17.14	QP
2	144.3348	42.20	-16.89	25.31	43.50	-18.19	QP
3	171.9946	40.13	-15.51	24.62	43.50	-18.88	QP
4	295.1469	35.45	-8.24	27.21	46.00	-18.79	QP
5	416.1791	36.21	-7.89	28.32	46.00	-17.68	QP
6	480.5276	38.80	-8.05	30.75	46.00	-15.25	QP

➢ Spurious Emission above 1GHz

Worst case at 802.11a

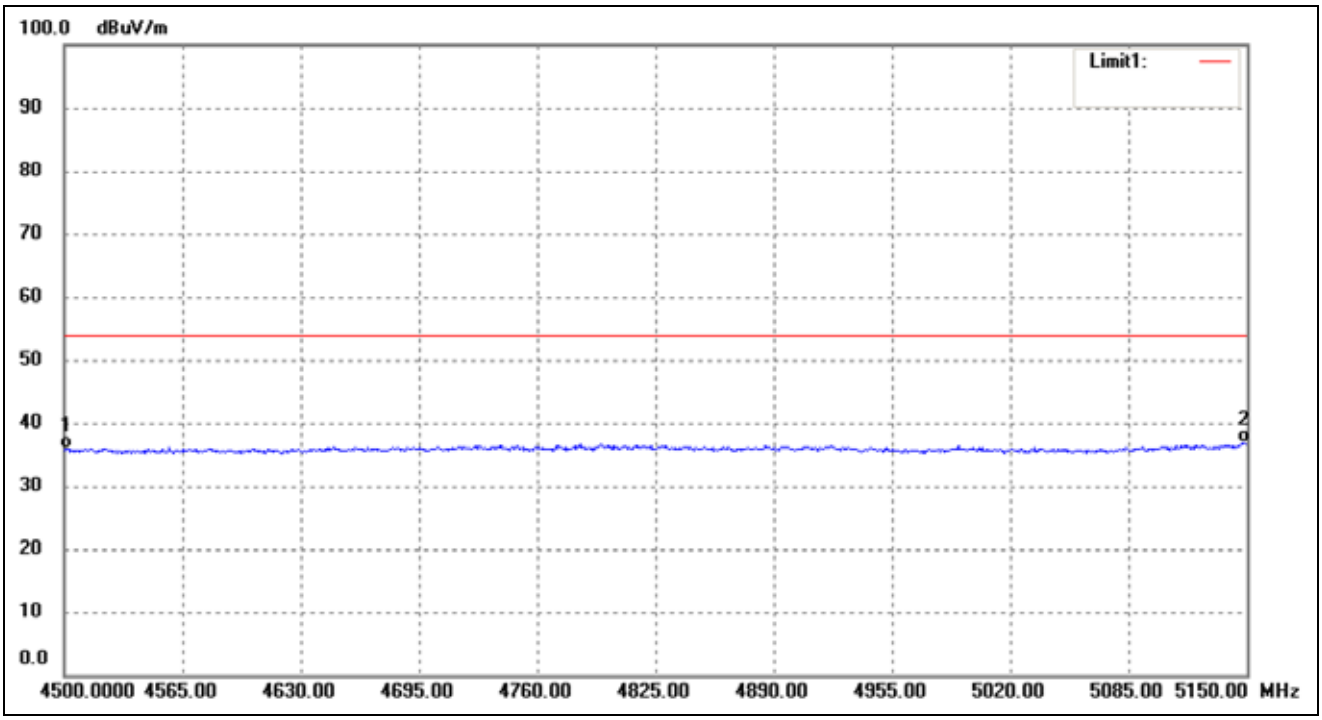
➢ Antenna A

802.11a- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Vertical(worst case)



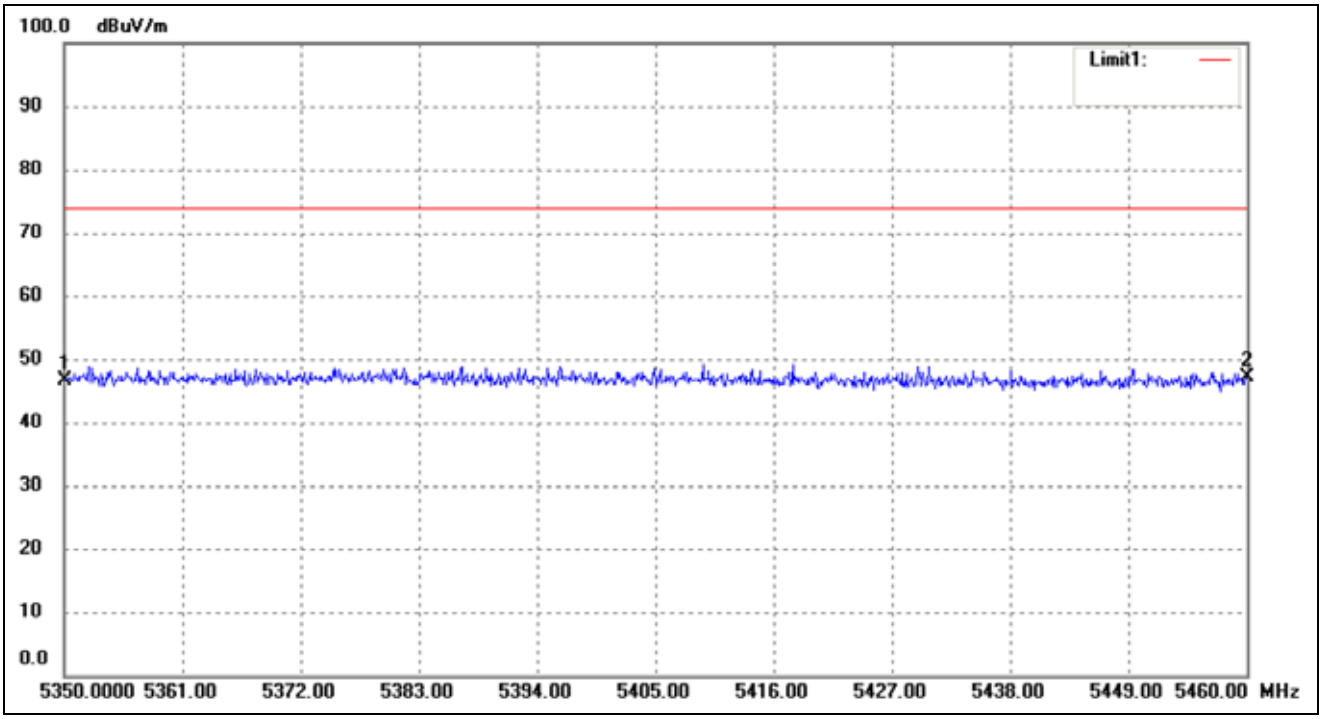
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	4500.000	50.69	-4.71	45.98	74.00	-28.02	peak
2	5150.000	52.65	-4.32	48.33	74.00	-25.67	peak

802.11a- Restricted Bandedge			
Test Channel	band 5.35-5.46GHz	Polarity:	Vertical(worst case)



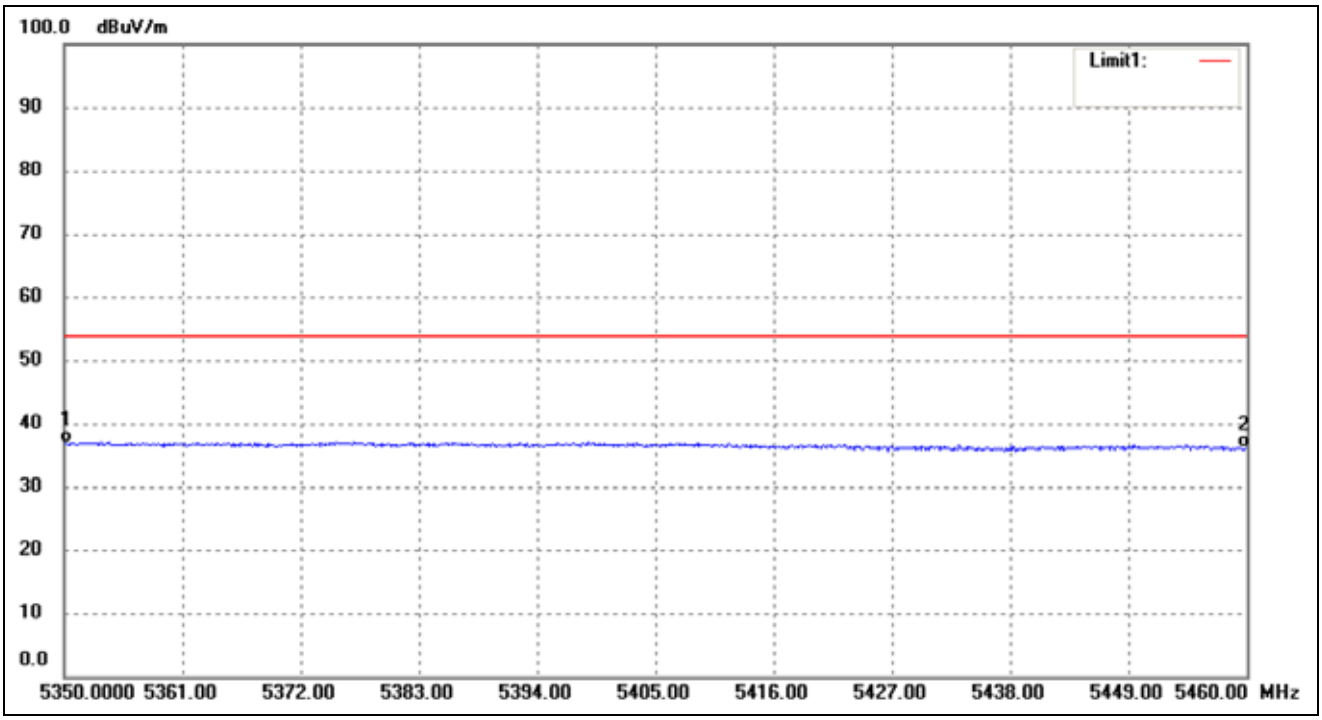
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	4500.000	40.50	-4.71	35.79	54.00	-18.21	AVG
2	5150.000	41.12	-4.32	36.80	54.00	-17.20	AVG

802.11a- Restricted Bandedge			
Test Channel	band 5.35-5.46GHz	Polarity:	Vertical(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	5350.000	50.84	-4.21	46.63	74.00	-27.37	peak
2	5460.000	51.37	-4.16	47.21	74.00	-26.79	peak

802.11a- Restricted Bandedge			
Test Channel	band 5.35-5.46GHz	Polarity:	Vertical(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	5350.000	41.14	-4.21	36.93	54.00	-17.07	AVG
2	5460.000	40.35	-4.16	36.19	54.00	-17.81	AVG

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

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11a)
  Worst case
- Antenna B
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	57.24	7.11	64.35	74	-9.65	H	PK
15540	39.29	8.22	47.51	54	-6.49	H	AV
10360	58.94	7.11	66.05	74	-7.95	V	PK
15540	37.75	8.22	45.97	54	-8.03	V	AV
Middle Channel (5200MHz)							
10400	57.56	7.22	64.78	74	-9.22	H	PK
15600	35.42	8.67	44.09	54	-9.91	H	AV
10400	57.11	7.22	64.33	74	-9.67	V	PK
15600	38.16	8.67	46.83	54	-7.17	V	AV
High Channel (5240MHz)							
10480	55.74	7.69	63.43	74	-10.57	H	PK
15720	38.98	8.93	47.91	54	-6.09	H	AV
10480	60.31	7.69	68.00	74	-6.00	V	PK
15720	39.46	8.93	48.39	54	-5.61	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5745MHz)							
11490	57.27	9.45	66.72	74	-7.28	H	PK
17235	34.91	10.36	45.27	54	-8.73	H	AV
11490	55.37	9.45	64.82	74	-9.18	V	PK
17235	36.25	10.36	46.61	54	-7.39	V	AV
Middle Channel (5785MHz)							
11570	57.87	9.62	67.49	74	-6.51	H	PK
17355	36.61	10.67	47.28	54	-6.72	H	AV
11570	57.53	9.62	67.15	74	-6.85	V	PK
17355	36.09	10.67	46.76	54	-7.24	V	AV
High Channel (5825MHz)							
11650	55.96	9.84	65.80	74	-8.20	H	PK
17475	33.17	10.95	44.12	54	-9.88	H	AV
11650	55.24	9.84	65.08	74	-8.92	V	PK
17475	36.62	10.95	47.57	54	-6.43	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-35.74	-27
Highest	Above 5350	-42.68	-27
Note: the data just list the worst cases			

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-37.39	-27
	5715 to 5725	-40.45	-17
Highest	5850 to 5860	-40.56	-17
	Above 5860	-43.49	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11HT20)
- Antenna A & Antenna B
- Harmonics And Spurious Emissions

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel (5180MHz)							
10360	56.42	7.11	63.53	74	-10.47	H	PK
15540	39.72	8.22	47.94	54	-6.06	H	AV
10360	60.47	7.11	67.58	74	-6.42	V	PK
15540	38.43	8.22	46.65	54	-7.35	V	AV
Middle Channel (5200MHz)							
10400	59.86	7.22	67.08	74	-6.92	H	PK
15600	35.71	8.67	44.38	54	-9.62	H	AV
10400	57.40	7.22	64.62	74	-9.38	V	PK
15600	37.04	8.67	45.71	54	-8.29	V	AV
High Channel (5240MHz)							
10480	55.21	7.69	62.90	74	-11.10	H	PK
15720	39.25	8.93	48.18	54	-5.82	H	AV
10480	60.20	7.69	67.89	74	-6.11	V	PK
15720	38.00	8.93	46.93	54	-7.07	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5745MHz)							
11490	57.47	9.45	66.92	74	-7.08	H	PK
17235	36.69	10.36	47.05	54	-6.95	H	AV
11490	55.31	9.45	64.76	74	-9.24	V	PK
17235	36.40	10.36	46.76	54	-7.24	V	AV
Middle Channel (5785MHz)							
11570	57.03	9.62	66.65	74	-7.35	H	PK
17355	35.19	10.67	45.86	54	-8.14	H	AV
11570	56.45	9.62	66.07	74	-7.93	V	PK
17355	37.21	10.67	47.88	54	-6.12	V	AV
High Channel (5825MHz)							
11650	55.23	9.84	65.07	74	-8.93	H	PK
17475	34.84	10.95	45.79	54	-8.21	H	AV
11650	57.01	9.84	66.85	74	-7.15	V	PK
17475	36.64	10.95	47.59	54	-6.41	V	AV

➢ Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-32.14	-27
Highest	Above 5350	-37.76	-27
Note: the data just list the worst cases			

➢ Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-46.34	-27
	5715 to 5725	-34.78	-17
Highest	5850 to 5860	-35.70	-17
	Above 5860	-41.45	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz5.725-5.850GHz (802.11n HT40)
- Antenna A & Antenna B
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5190MHz)							
10380	59.19	7.25	66.44	74	-7.56	H	PK
15570	37.51	8.33	45.84	54	-8.16	H	AV
10380	59.44	7.25	66.69	74	-7.31	V	PK
15570	38.80	8.33	47.13	54	-6.87	V	AV
High Channel (5230MHz)							
10460	57.34	7.54	64.88	74	-9.12	H	PK
15690	39.47	8.86	48.33	54	-5.67	H	AV
10460	60.81	7.54	68.35	74	-5.65	V	PK
15690	37.43	8.86	46.29	54	-7.71	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5755MHz)							
11510	55.60	9.65	65.25	74	-8.75	H	PK
17265	36.81	10.87	47.68	54	-6.32	H	AV
11510	57.22	9.65	66.87	74	-7.13	V	PK
17265	36.34	10.87	47.21	54	-6.79	V	AV
High Channel (5795MHz)							
11590	55.62	9.81	65.43	74	-8.57	H	PK
17385	33.77	10.89	44.66	54	-9.34	H	AV
11590	57.74	9.81	67.55	74	-6.45	V	PK
17385	36.69	10.89	47.58	54	-6.42	V	AV

- Out of Band edge 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-36.79	-27
Highest	Above 5350	-40.55	-27
Note: the data just list the worst cases			

➢ Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-40.25	-27
	5715 to 5725	-40.65	-17
Highest	5850 to 5860	-42.88	-17
	Above 5860	-40.54	-27
Note: the data just list the worst cases			

Note: this EUT was tested in the low, high channel and the worst case position data was reported.

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11ac VHT80)
- Antenna A & Antenna B
- Harmonics And Spurious Emissions
-

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5210MHz							
10420	58.48	7.33	65.81	74	-8.19	H	PK
15630	36.17	8.75	44.92	54	-9.08	H	AV
10420	57.39	7.33	64.72	74	-9.28	V	PK
15630	36.15	8.75	44.90	54	-9.10	V	AV

-

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5775MHz							
11550	56.52	9.54	66.06	74	-7.94	H	PK
17325	37.91	10.59	48.50	54	-5.50	H	AV
11550	56.72	9.54	66.26	74	-7.74	V	PK
17325	34.40	10.59	44.99	54	-9.01	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-32.37	-27
Highest	Above 5350	-31.81	-27
Note: the data just list the worst cases			

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-43.81	-27
	5715 to 5725	-31.45	-17
Highest	5850 to 5860	-29.63	-17
	Above 5860	-39.04	-27
Note: the data just list the worst cases			

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

10. Frequency Stability

10.1 Standard Applicable

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

10.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

10.3 Summary of Test Results/Plots

ANT A

U-NII-1:5150-5250MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	5	-30	109	0.0209
100%		-20	130	0.0249
100%		-10	137	0.0264
100%		0	129	0.0248
100%		+10	128	0.0246
100%		+20	154	0.0295
100%		+30	90	0.0173
100%		+40	150	0.0288
100%		+50	89	0.0170
Low Battery power	4.5	+20	161	0.0310
High Battery power	5.5	+20	141	0.0271

U-NII-1:5725-5850MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	5	-30	86	0.0148
100%		-20	125	0.0216
100%		-10	137	0.0236
100%		0	127	0.0220
100%		+10	115	0.0198
100%		+20	151	0.0261
100%		+30	98	0.0169
100%		+40	155	0.0268
100%		+50	84	0.0146
Low Battery power	4.5	+20	156	0.0270
High Battery power	5.5	+20	145	0.0251

ANT B

U-NII-1:5150-5250MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	5	-30	88	0.0170
100%		-20	127	0.0244
100%		-10	143	0.0275
100%		0	133	0.0256
100%		+10	120	0.0230
100%		+20	150	0.0288
100%		+30	102	0.0196
100%		+40	155	0.0297
100%		+50	81	0.0156
Low Battery power	4.5	+20	155	0.0297
High Battery power	5.5	+20	148	0.0284

U-NII-1:5725-5850MHz worst case at 802.11a middle channel				
Voltage(%)	Power(VDC)	TEMP(°C)	Freq.Dev(Hz)	Deviation
100%	5	-30	94	0.0162
100%		-20	121	0.0208
100%		-10	143	0.0246
100%		0	133	0.0230
100%		+10	116	0.0201
100%		+20	152	0.0263
100%		+30	104	0.0179
100%		+40	156	0.0269
100%		+50	84	0.0145
Low Battery power	4.5	+20	155	0.0268
High Battery power	5.5	+20	144	0.0248

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