TEST REPORT

Product Name:	Mid-Tier 802.11ac Wi-Fi Access Point
Trade Mark:	GRANDSTREAM
Model No. / HVIN:	GWN7602
Report Number:	191025009RFC-2
Test Standards:	FCC 47 CFR Part 15 Subpart E RSS-247 Issue 2 RSS-Gen Issue 5
FCC ID:	YZZGWN7602
IC:	11964A-GWN7602
Test Result:	PASS
Date of Issue:	December 2, 2019

Prepared for:

Grandstream Networks,Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

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Date: December 2, 2019

Version

Version No.	Date	Description
V1.0	December 2, 2019	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks,Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks,Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Mid-Tier 802.11ac Wi-Fi Access Point		
Model No. / HVIN:	GWN7602		
Trade Mark:	GRANDSTREAM		
DUT Stage:	Identical Prototype		
EUT Supports Function:	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac
Software Version:	1.0.0.4		
Hardware Version:	V1		
Sample Received Date:	October 25, 2019		
Sample Tested Date:	October 25, 2019 to November 23, 2019		

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)
	5 725 MHz to 5 850 MHz (U-NII-3)
Frequency Ranges:	5180 MHz to 5240 MHz
	5 745 MHz to 5 825 MHz
Support Standards:	IEEE 802.11a/n/ac
TPC Function:	Not Support
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11ac: OFDM(64QAM, 16QAM, QPSK, BPSK)
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz
	IEEE 802.11n-HT40/ac-VHT40: 40 MHz
	IEEE 802.11ac-VHT80: 80 MHz
Data Rate:	IEEE 802.11a: Up to 54 Mbps
	IEEE 802.11n-HT20: Up to MCS15
	IEEE 802.11n-HT40: Up to MCS15
	IEEE 802.11ac-VHT20: Up to MCS8
	IEEE 802.11ac-VHT40: Up to MCS9
	IEEE 802.11ac-VHT80: Up to MCS9
Number of Channels:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40)/ac-VHT40 1 for IEEE 802.11acVHT80

	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80	
Antenna Type:	Chain 0	PCB Antenna
	Chain 1	PCB Antenna
Antenna Gain:	Chain 0	5150 MHz to 5250 MHz: 3.5 dBi
		5725 MHz to 5850 MHz: 3.5 dBi
	Chain 1	5150 MHz to 5250 MHz: 3.0 dBi
		5725 MHz to 5850 MHz: 3.0 dBi

Maximum conducted output power (dBm):	**MIMO_Chain 0+1**	**U-NII-1**	**U-NII-3**
	IEEE 802.11a:	17.03	21.37
	IEEE 802.11n-HT20:	17.28	20.52
	IEEE 802.11n-HT40:	17.81	21.01
	IEEE 802.11ac-VHT20:	17.38	20.64
	IEEE 802.11ac-VHT40:	17.70	20.91
	IEEE 802.11ac-VHT80:	12.78	16.83

Maximum EIRP (dBm):	**MIMO_Chain 0+1**	**U-NII-1**
	IEEE 802.11a:	20.28
	IEEE 802.11n-HT20:	20.54
	IEEE 802.11n-HT40:	21.06
	IEEE 802.11ac-VHT20:	20.63
	IEEE 802.11ac-VHT40:	20.95
	IEEE 802.11ac-VHT80:	16.01

1.4 OTHER INFORMATION

Operation Frequency Each of Channel		
	U-NII-1	**U-NII-3**
IEEE 802.11a, IEEE 802.11n-HT20, IEEE 802.11ac-VHT20	**f = 5000 + 5k, k = 32 + 4n**	**f = 5000 + 5k, k = 145 + 4n**
	n = 1,…, 4	**n = 1,…, 5**
IEEE 802.11n-HT40, IEEE 802.11ac-VHT40	**f = 5000 + 5k, k = 30 + 8n**	**f = 5000 + 5k, k = 143 + 8n**
	n = 1, 2	**n = 1, 2**
IEEE 802.11ac-VHT80	**f = 5000 + 5k, k = 26 + 16n**	**f = 5000 + 5k, k = 155**
	n = 1	
Note: **f** is the operating frequency (MHz); **k** is the operating channel.		

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.3 Meter	UnionTrust
2	Lan*3	RJ-45	1.5 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart E Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203 FCC 47 CFR Part 15 Subpart E Section 15.407(a)(1) (2) RSS-Gen Issue 5, Section 6.8	N/A	PASS
26 dB emission bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(5) RSS-247 Issue 2 Section 6.2.1.2	KDB 789033 D02 v02r01 Section C.1	PASS
6 dB bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (e) RSS-247 Issue 2 Section 6.2.4.1	KDB 789033 D02 v02r01 Section C.2	PASS
Occupied Bandwidth	RSS-Gen Issue 5, Section 6.7	RSS-Gen Issue 5, section 6.7	PASS
Maximum conducted output power	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(3) RSS-247 Issue 2 Section 6.2.1.1/6.2.4.1	KDB 789033 D02 v02r01 Section E.3.a (Method PM)	PASS
Peak Power Spectral Density	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(3) RSS-247 Issue 2 Section 6.2.1.1/6.2.4.1	KDB 789033 D02 v02r01 Section F	PASS
Radiated Emissions and Band Edge Measurement	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(4)(6) FCC 47 CFR Part 15 Subpart C Section 15.209/205 RSS-247 Issue 2 Section 6.2.1.2/6.2.4.2	KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6	PASS
Dynamic Frequency Selection	FCC 47 CFR Part 15 Subpart E Section 15.407 (h) RSS-247 Issue 2 Section 6.3	KDB 905462 D03 Client Without DFS New Rules v01r02	N/A (Note 1, 2)
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(6) FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013, Section 6.2.	PASS
Note: 1) N/A: In this whole report not applicable. 2) This EUT does not support U-NII-2A and U-NII-2C frequency bands.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2018	Nov. 24, 2019
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2018	Nov. 24, 2019
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Dec. 03, 2018	Dec. 03, 2019
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 08, 2018	Dec. 08, 2019
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Dec. 08, 2018	Dec. 08, 2019
☒	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2018	Nov. 24, 2019
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	May 18, 2019	May 18, 2020
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 24, 2018	Nov. 24, 2019
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Dec. 08, 2018	Dec. 08, 2019
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 18, 2019	May 18, 2020
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jun. 23, 2019	Jun. 23, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jan. 05, 2019	Jan. 05, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	Receiver	R&S	ESR7	1316.3003K07 -101181-K3	Nov. 24, 2018	Nov. 24, 2019
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 24, 2018	Nov. 24, 2019
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 24, 2018	Nov. 24, 2019
☐	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 24, 2018	Nov. 24, 2019
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2018	Nov. 24, 2019
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Nov. 24, 2018	Nov. 24, 2019
☐	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	Nov. 24, 2018	Nov. 24, 2019
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	Nov. 24, 2018	Nov. 24, 2019

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage	Relative Humidity (%)
NT/NV	+15 to +35	120V~60Hz and 240V~50Hz	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
26 dB emission bandwidth	24.3	51	99.8	Hank Wu
6 dB bandwidth	24.3	51	99.8	Hank Wu
Occupied Bandwidth	24.3	51	99.8	Hank Wu
Maximum conducted output power	24.3	51	99.8	Hank Wu
Peak Power Spectral Density	24.3	51	99.8	Hank Wu
Radiated Emissions and Band Edge Measurement	25.9	58	100.06	Fire Huo
AC Power Line Conducted Emission	25.9	56	100.06	Bert Xiong

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a IEEE 802.11n-HT20 IEEE 802.11ac-VHT20	5150 MHz to 5250 MHz	Channel 36	Channel 44	Channel 48
		5180 MHz	5220 MHz	5240 MHz
	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n-HT40 IEEE 802.11ac-VHT40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5725 MHz to 5850 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz
IEEE 802.11ac-VHT80	5150 MHz to 5250 MHz	--	Channel 42	--
		--	5210 MHz	--
	5725 MHz to 5850 MHz	--	Channel 155	--
		--	5775 MHz	--

4.3 EUT TEST STATUS

Mode	Tx/Rx Function	Description
IEEE 802.11a/n/ac	2Tx/2Rx	1. Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

Power Setting				
Mode	U-NII-1		U-NII-3	
	Chain 0	Chain 1	Chain 0	Chain 1
IEEE 802.11a	L,M=12	L,M=12	1E	1D
	H=14	H=14		
IEEE 802.11n-HT20	L,M=12	L,M=12	1E	1D
	H=16	H=16		
IEEE 802.11n-HT40	L=10	L=10	L=1D	L=1C
	H=16	H=16	H=1E	H=1D
IEEE 802.11ac-VHT20	L,M=12	L,M=12	1E	1D
	H=16	H=16		
IEEE 802.11ac-VHT40	L=10	L=10	L=1D	L=1C
	H=16	H=16	H=1E	H=1D
IEEE 802.11ac-VHT80	8	8	17	16

Test Software
Test software name: MT76xxE_AP;

4.4 PRE-SCAN

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Following data rate was (were) selected for the final test as listed below

Mode	Worst-case data rates
IEEE 802.11a	6 Mbps
IEEE 802.11n-HT20	MCS0
IEEE 802.11n-HT40	MCS0
IEEE 802.11ac-VHT20	MCS0
IEEE 802.11ac-VHT40	MCS0
IEEE 802.11ac-VHT80	MCS0

4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

Figure 1. Below 30MHz

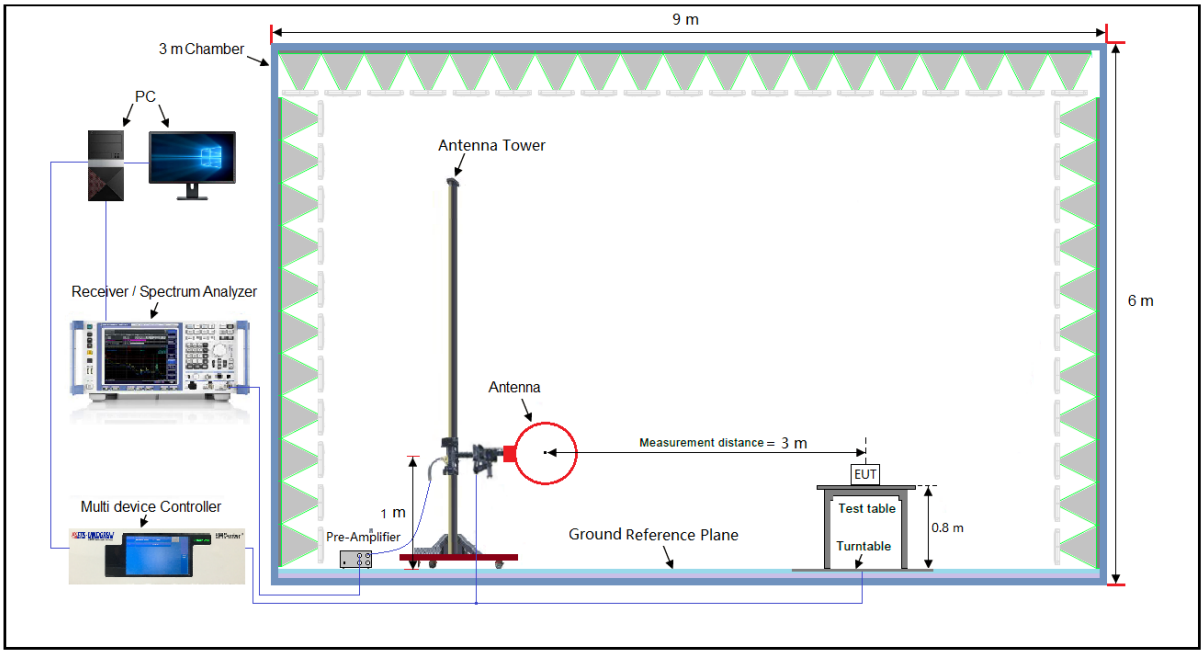


Figure 2. 30MHz to 1GHz

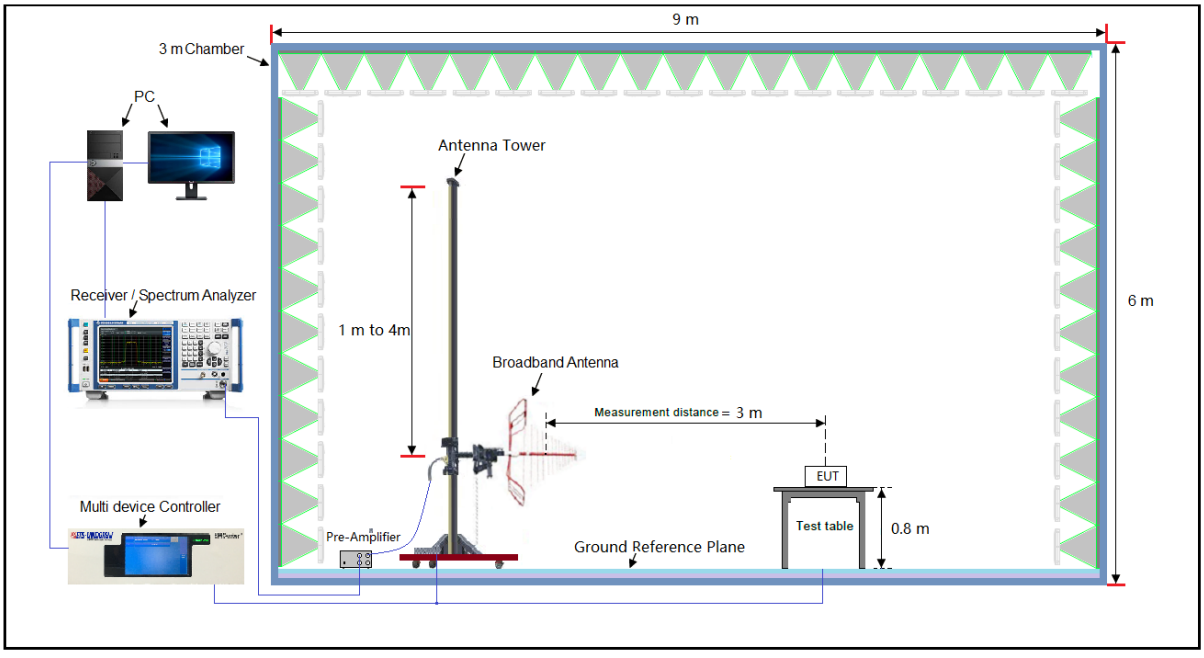
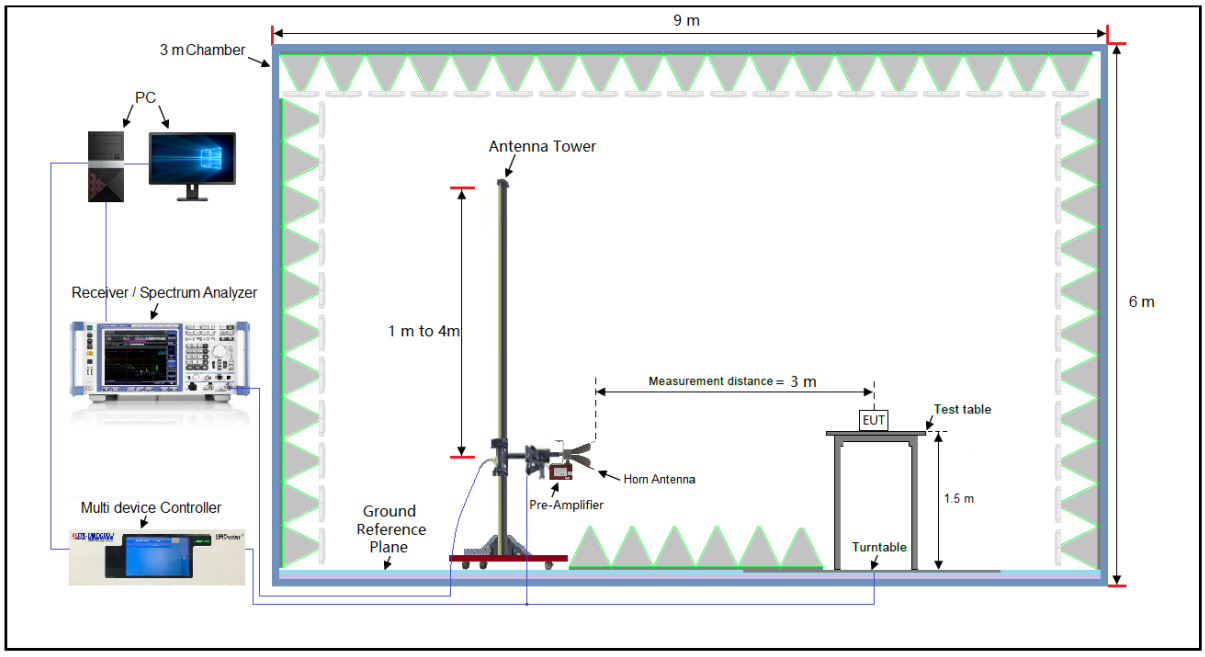
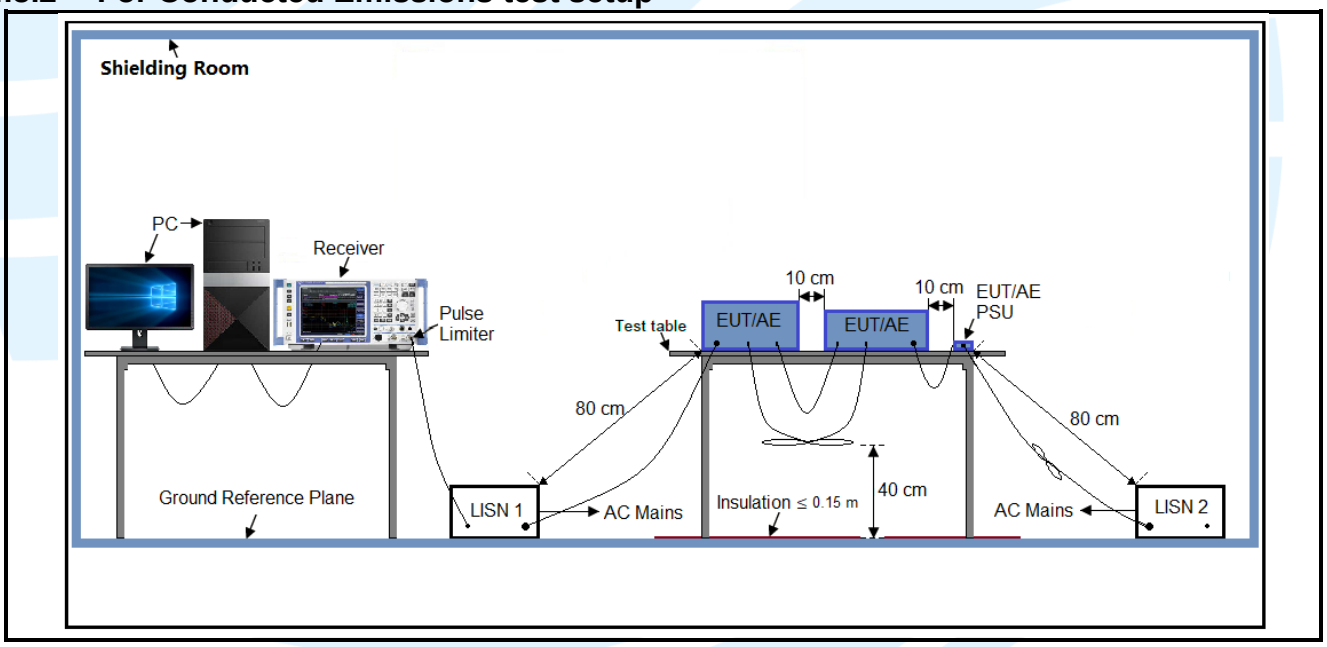


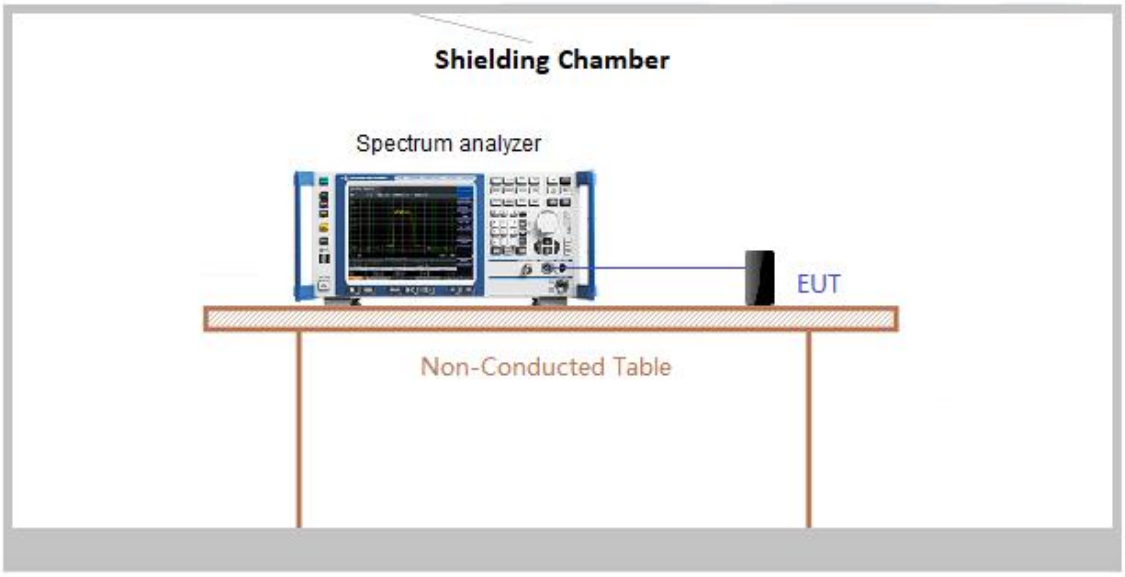
Figure 3. Above 1GHz



4.5.2 For Conducted Emissions test setup



4.5.3 For Conducted RF test setup



Normal Environment

4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	2TX	Chain 0+1	Y axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.7 DUTY CYCLE

Test Procedure: ANSI C63.10-2013 Clause 12.2.

Test Results

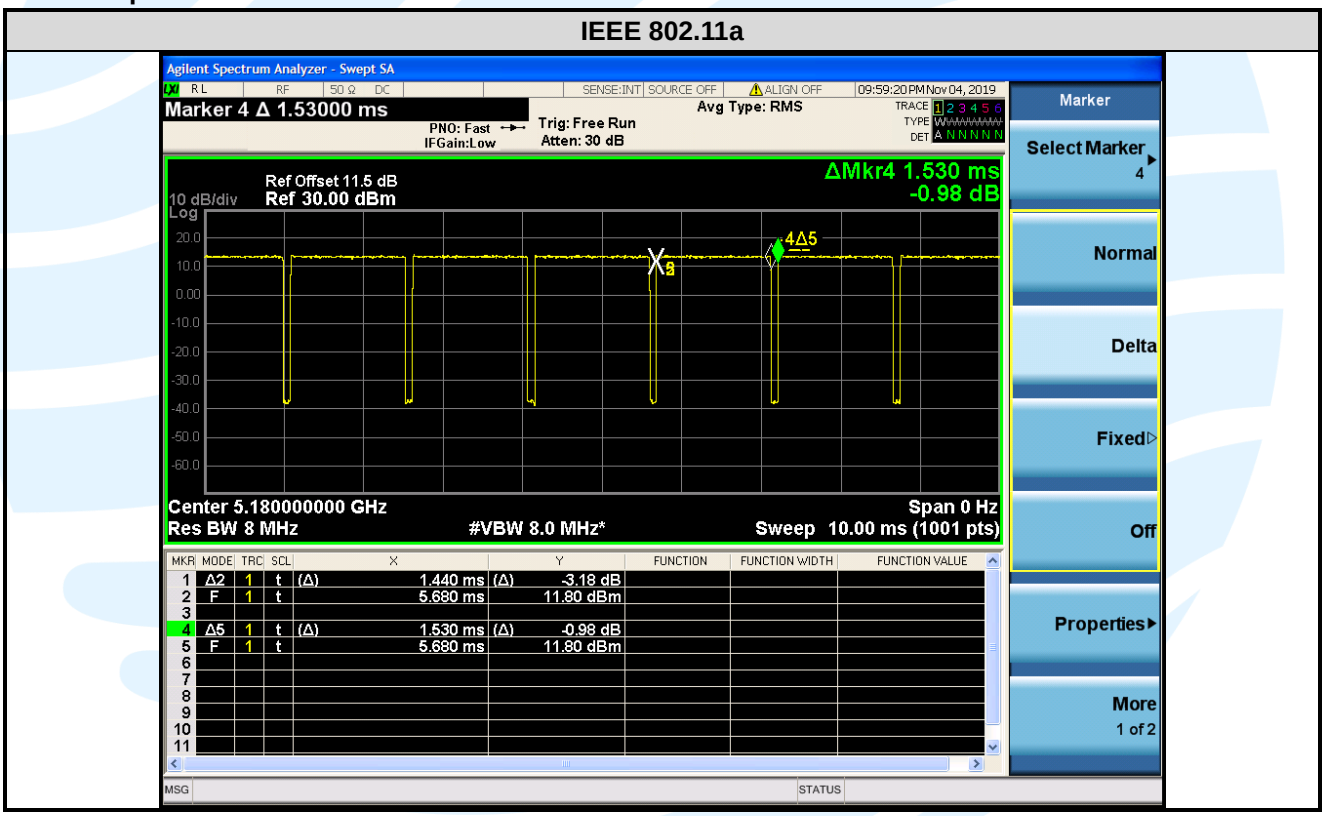
Mode	Data rates (Mbps)	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
IEEE 802.11a	6	1.440	1.530	0.94	94.12	0.26	0.69	-0.53
IEEE 802.11n-HT20	MCS0	1.350	1.495	0.90	90.30	0.44	0.74	-0.89
IEEE 802.11n-HT40	MCS0	0.669	0.840	0.80	79.64	0.99	1.49	-1.98
IEEE 802.11ac-VHT20	MCS0	1.360	1.520	0.89	89.47	0.48	0.74	-0.97
IEEE 802.11ac-VHT40	MCS0	0.675	0.828	0.82	81.52	0.89	1.48	-1.77
IEEE 802.11ac-VHT80	MCS0	0.334	0.460	0.73	72.61	1.39	2.99	-2.78

Remark:

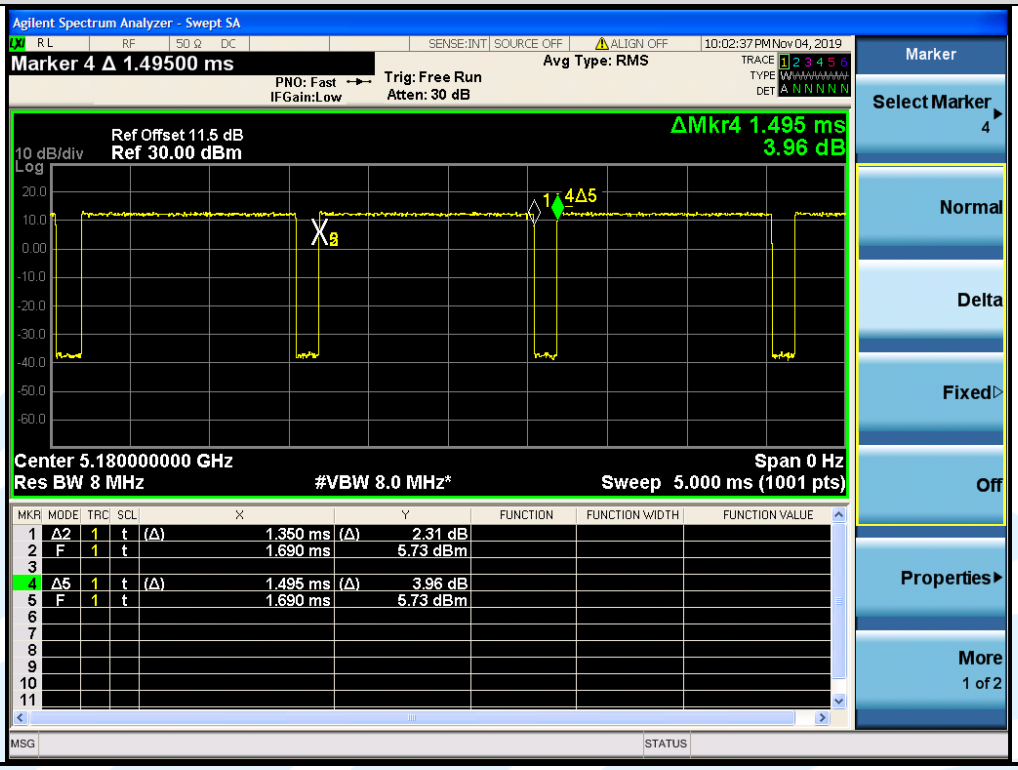
1) Duty cycle= On Time/ Period;
2) Duty Cycle factor = 10 * log(1/ Duty cycle);
3) Average factor = 20 $\log_{10}$ Duty Cycle.

The test plots as follows

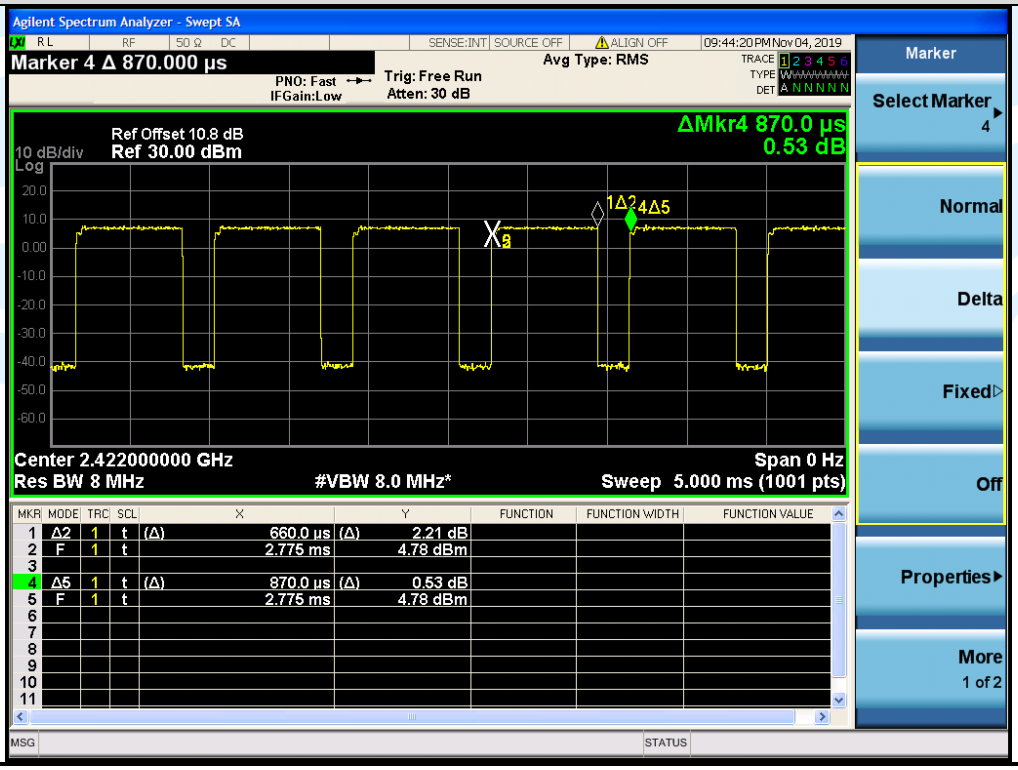
IEEE 802.11a



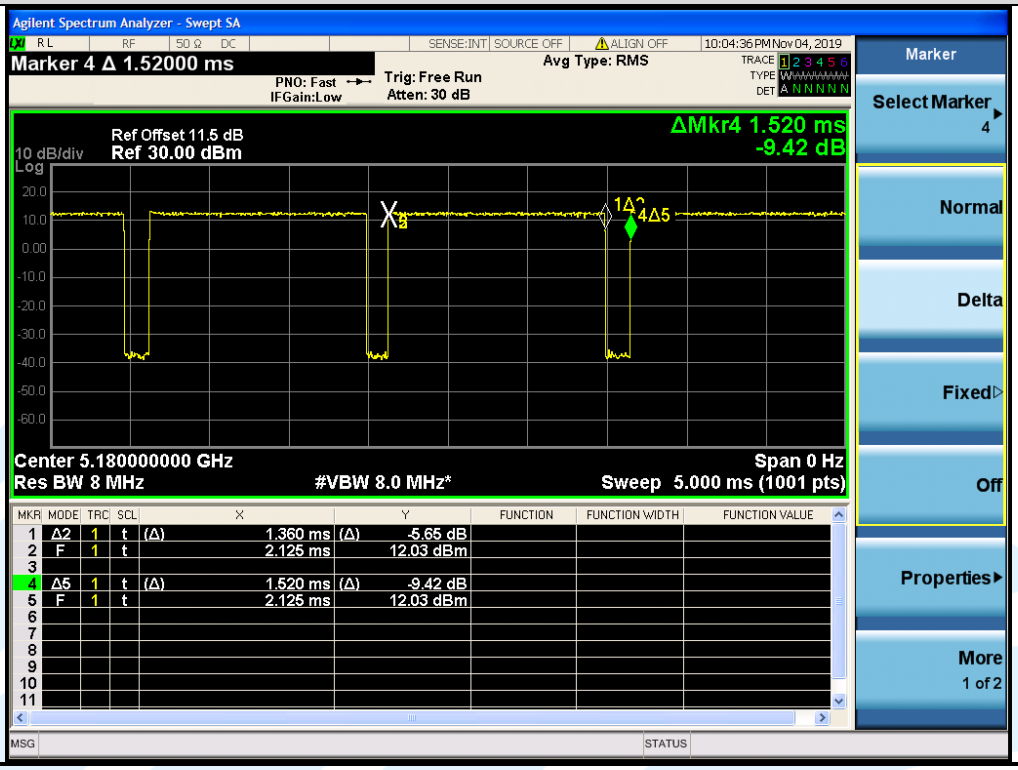
IEEE 802.11n-HT20



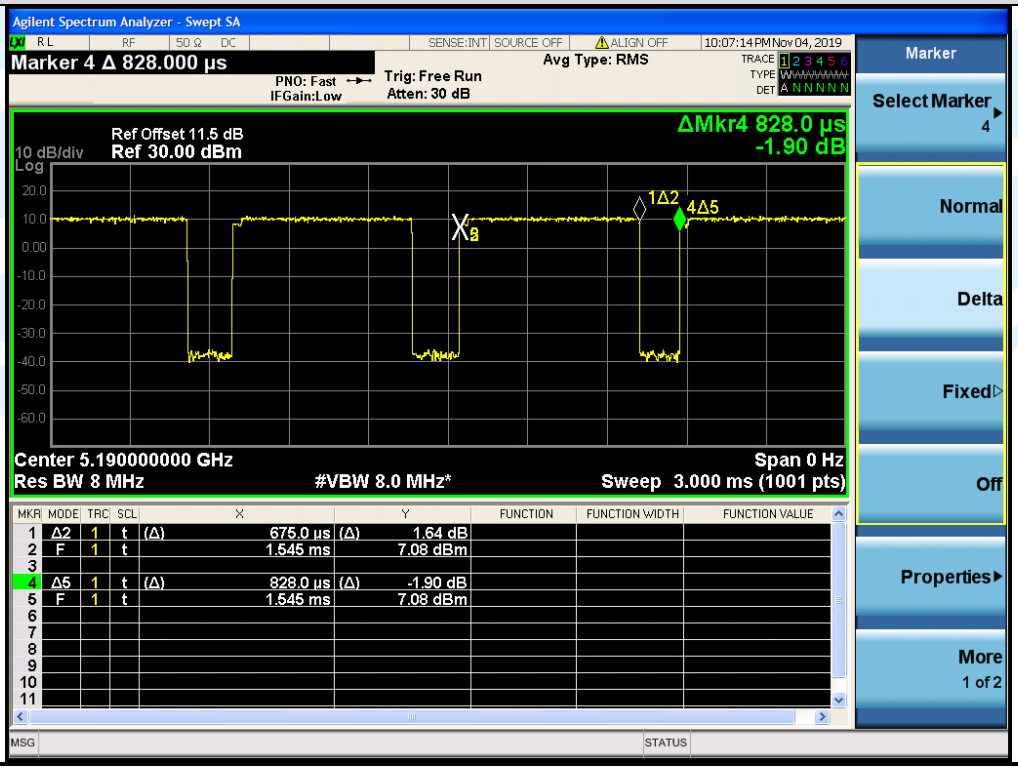
IEEE 802.11n-HT40



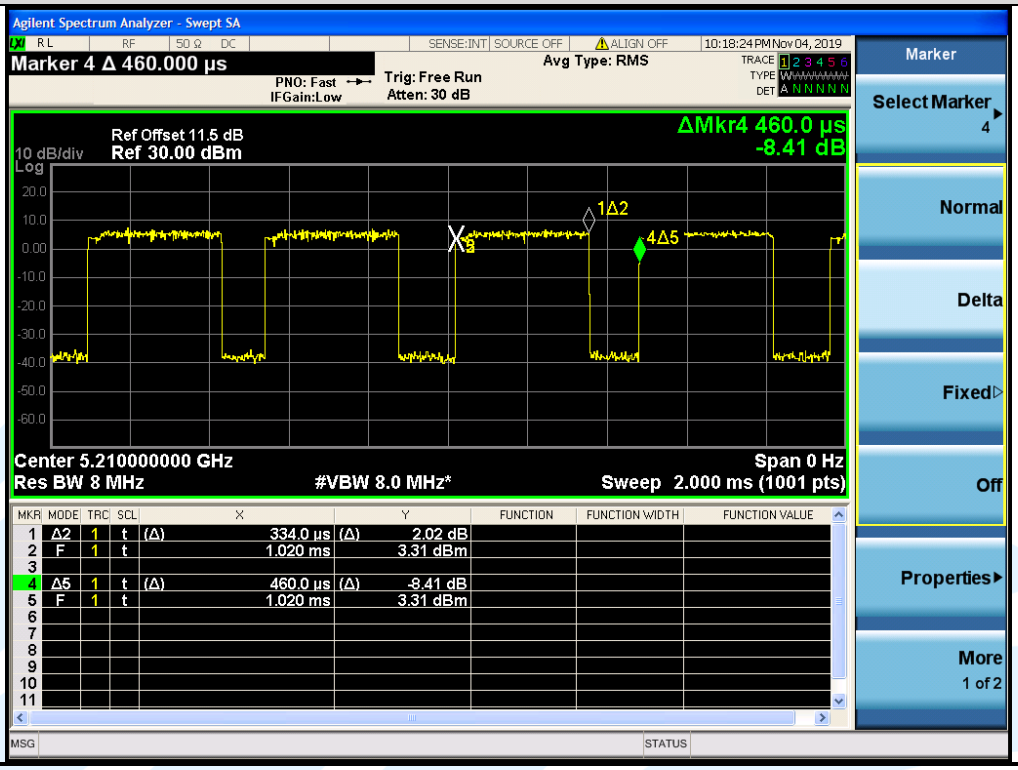
IEEE 802.11ac-VHT20



IEEE 802.11ac-VHT40



IEEE 802.11ac-VHT80



5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
4	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
5	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices
6	KDB 789033 D02 General UNII Test Procedures New Rules v02r01	Guidelines for compliance testing of unlicensed national information infrastructure (U-NII) device part 15, subpart E
7	KDB 905462 D06 802.11 Channel Plans New Rules v02	Operation in U-NII bands -802.11 channel PLAN(§15.407)
8	KDB 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. **15.407(a)(1) (2) requirement:** The conducted output power limit specified in paragraph (a) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (a) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the by the amount in dB that the directional gain of the antenna exceeds 6 dBi. **RSS-Gen Issue 5, Section 6.8 requirement:** According to RSS-Gen Issue 5, Section 6.8, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.
EUT Antenna:
Both antenna in the interior of the equipment and no consideration of replacement. The transmit signals are correlated with each other and the antenna gain of both chains is no consistent, the best case directional gain of the antenna is 6.26 dBi (See section 5.5).

5.3 26 DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(5)
RSS-247 Issue 2 Section 6.2.1.2

Test Method: KDB 789033 D02 v02r01 Section C.1

Limit: None; for reporting purposes only.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum analyzer.

Spectrum analyzer according to the following Settings:
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 peak 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 %.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

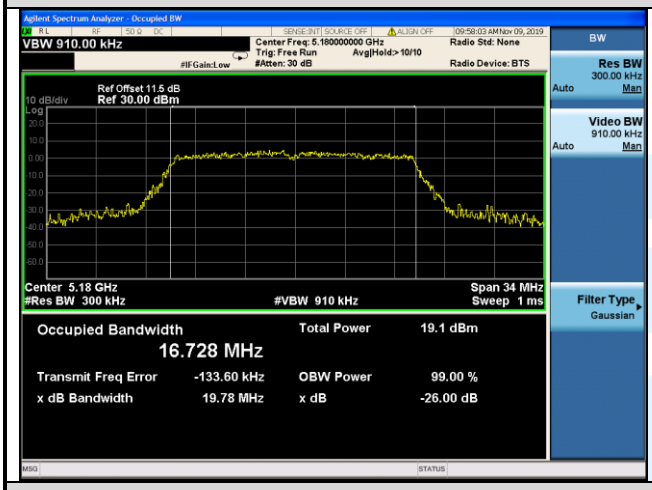
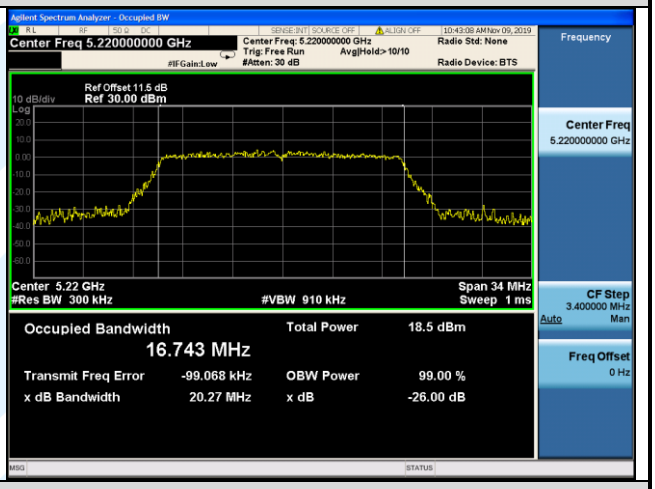
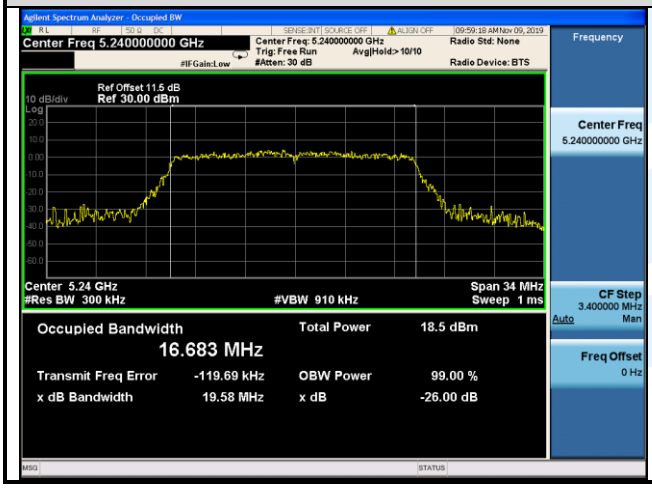
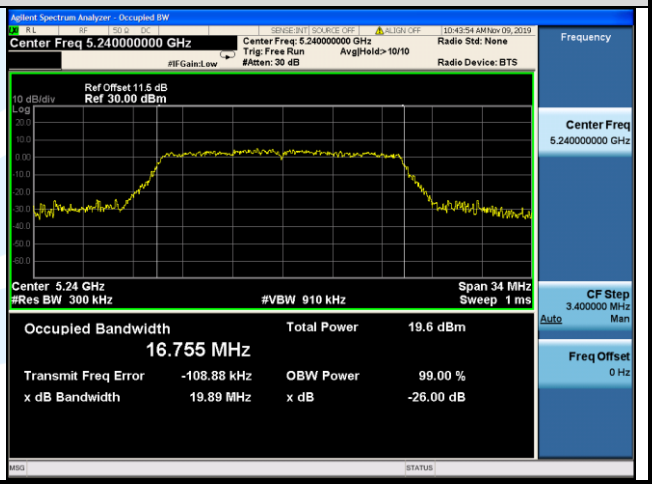
Instruments Used: Refer to section 3 for details

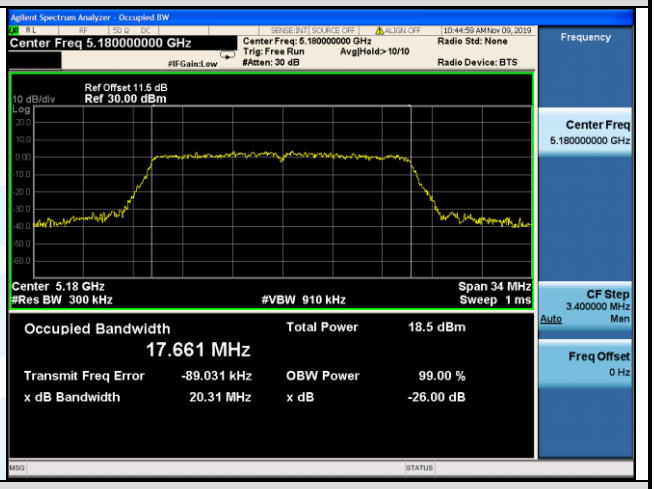
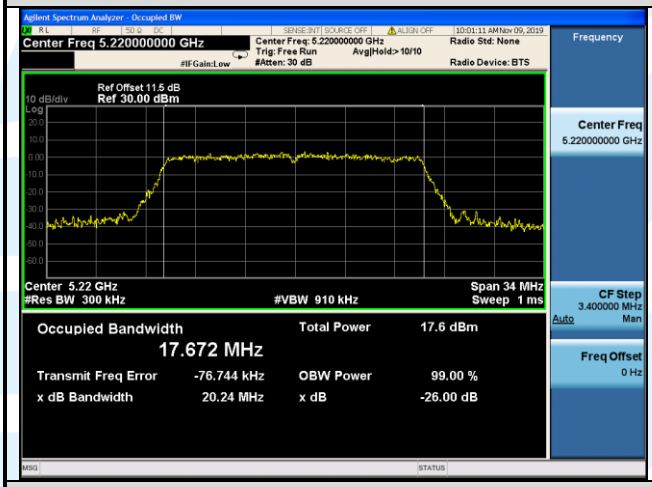
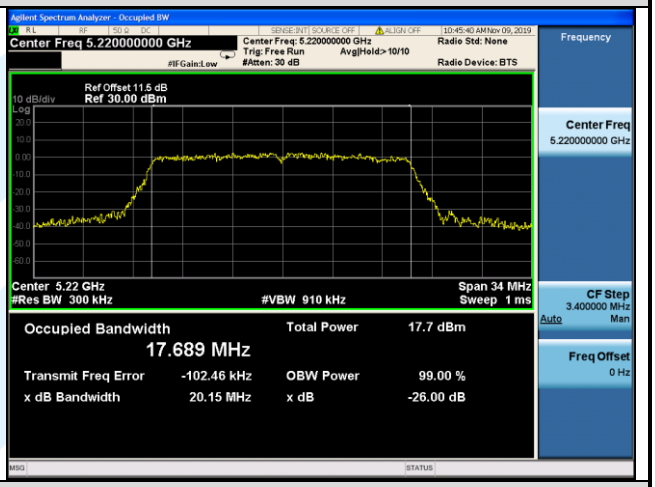
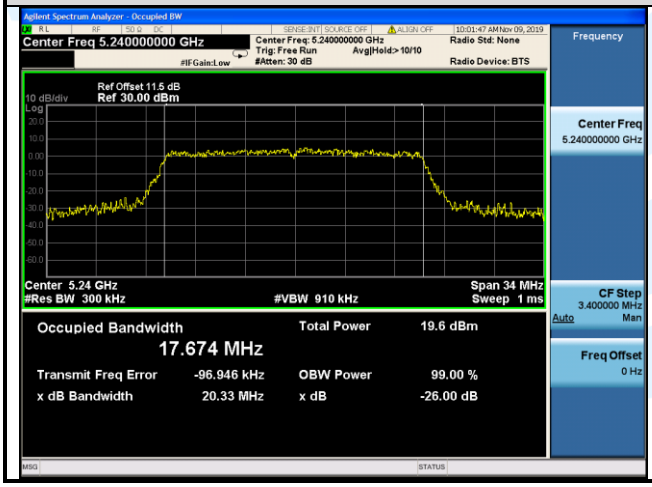
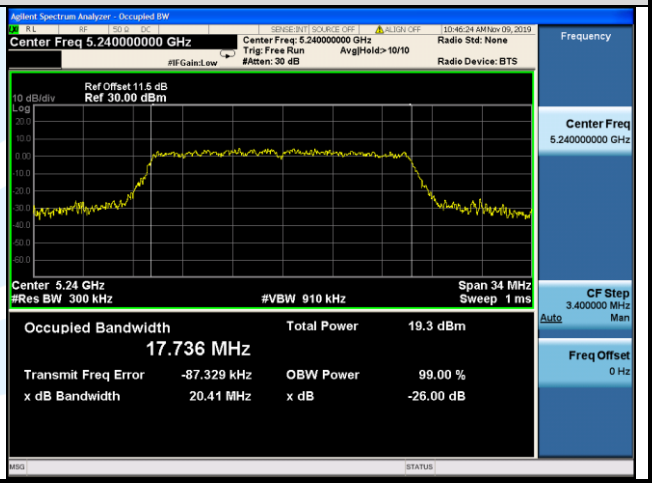
Test Results: Pass

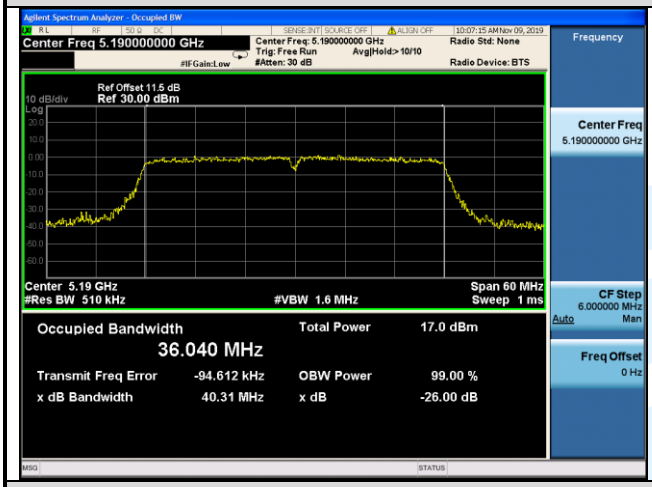
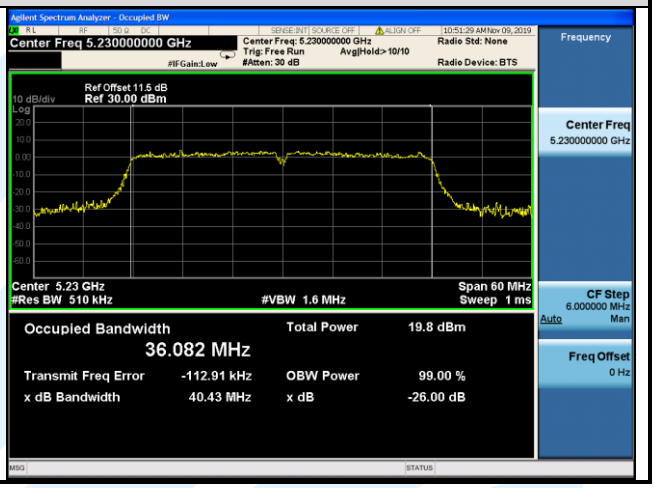
Mode	Channel	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
IEEE 802.11a	36 (5180)	19.78	19.76	16.728	16.747
	44 (5220)	19.78	20.27	16.700	16.743
	48 (5240)	19.58	19.89	16.683	16.755
IEEE 802.11n-HT20	36 (5180)	19.58	20.31	16.683	17.661
	44 (5220)	20.24	20.15	17.672	17.689
	48 (5240)	20.33	20.41	17.674	17.736
IEEE 802.11n-HT40	38 (5190)	40.13	40.49	36.040	36.029
	46 (5230)	40.41	40.43	36.121	36.082
IEEE 802.11ac-VHT20	36 (5180)	29.56	20.18	17.776	17.666
	44 (5220)	20.22	20.30	17.648	17.683
	48 (5240)	20.12	20.40	17.663	17.715
IEEE 802.11ac-VHT40	38 (5190)	40.17	39.84	36.020	35.997
	46 (5230)	40.14	40.14	36.099	36.115
IEEE 802.11ac-VHT80	42 (5230)	81.84	81.36	75.051	75.101

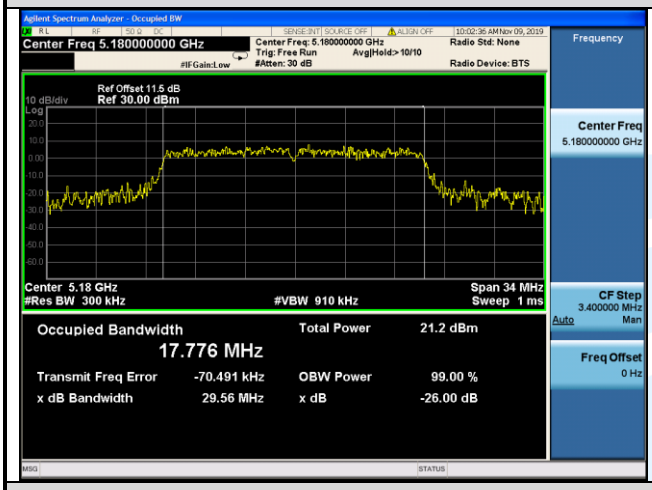
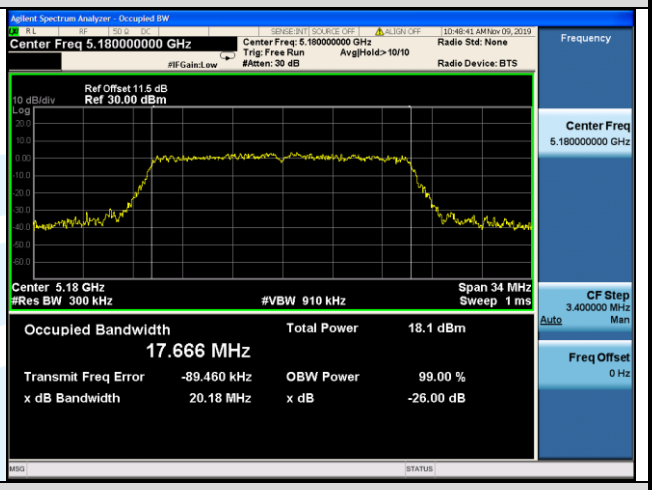
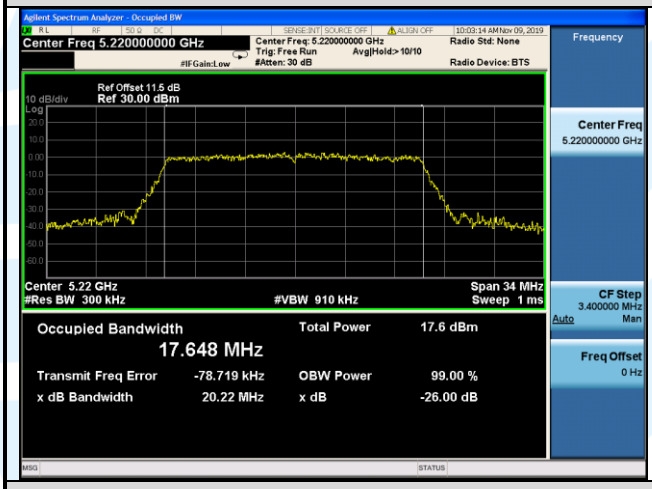
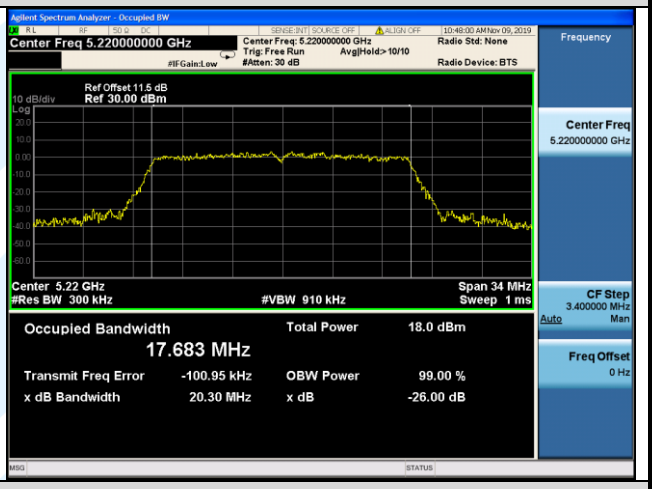
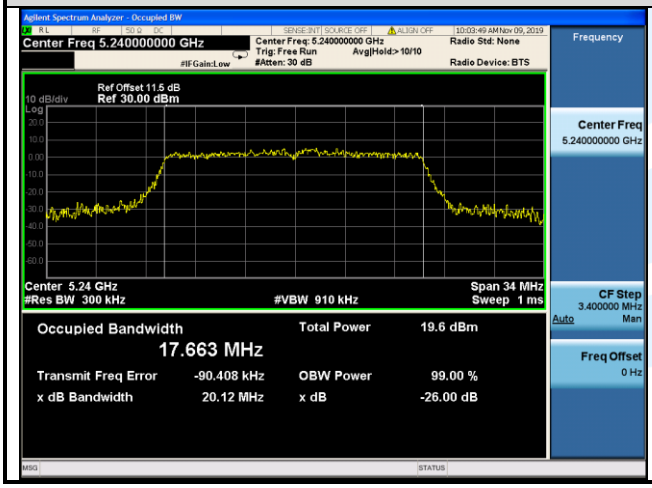
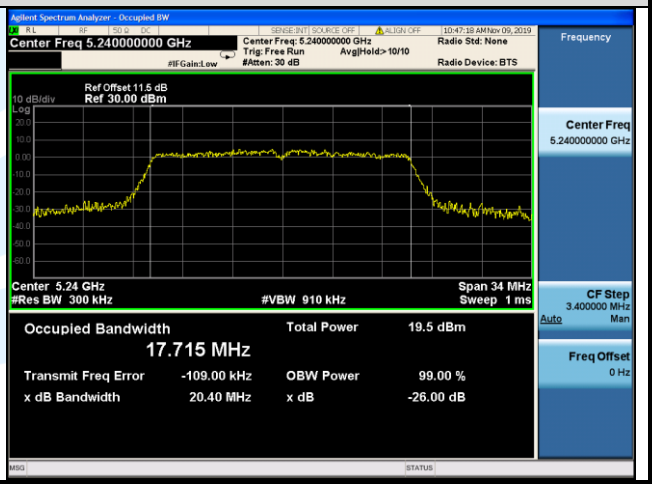
Remark:
For the case if a channel operating in U-NII 1 band has a 26-dB bandwidth that straddles into U-NII 2A band but its 99% occupied power bandwidth does not. For this rare case, DFS requirement does not apply.

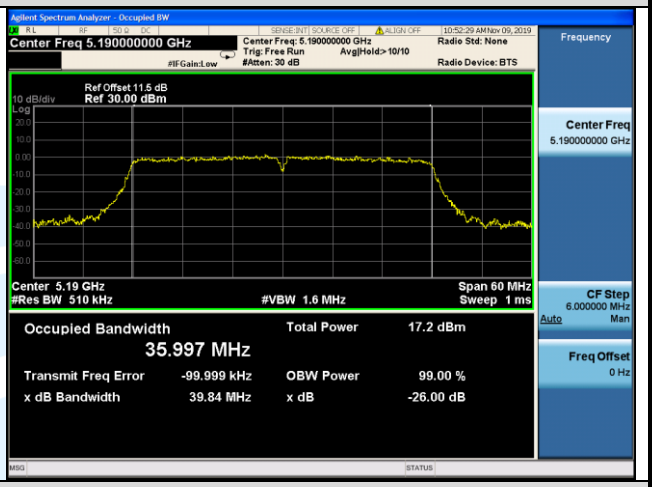
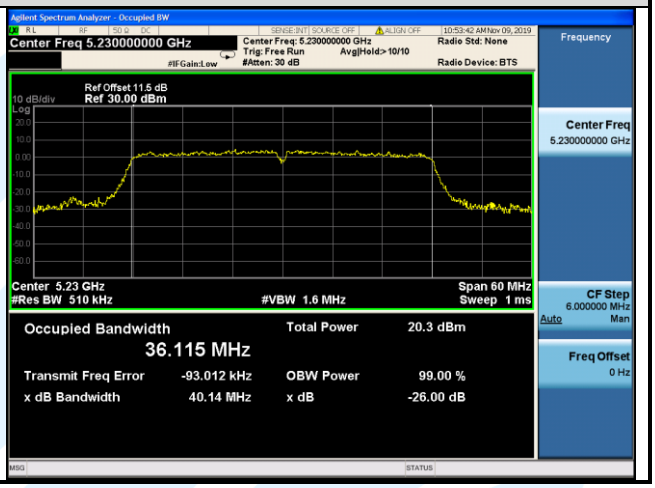
The test plots as follows:

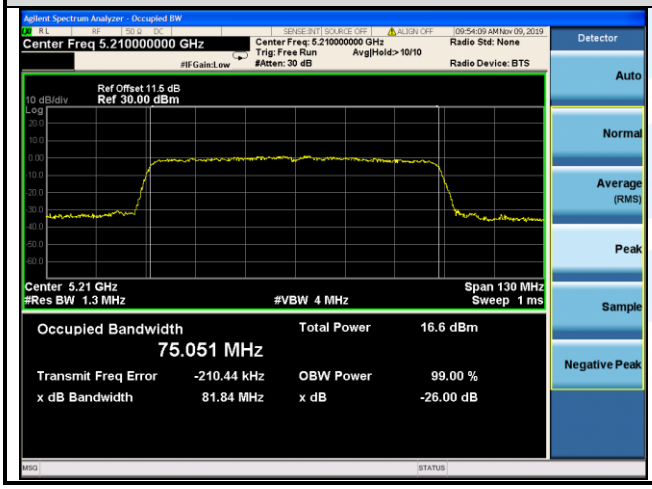
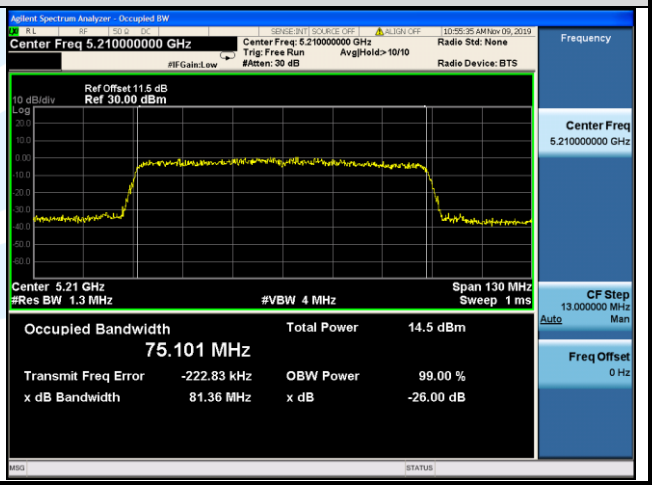
IEEE 802.11a	
Chain 0	Chain 1
Channel 36	
	
Channel 44	
	
Channel 48	
	

IEEE 802.11n-HT20	
Chain 0	Chain 1
Channel 36	
	
Channel 44	
	
Channel 48	
	

IEEE 802.11n-HT40	
Chain 0	Chain 1
Channel 38	
	
Channel 46	
	

IEEE 802.11ac-VHT20	
Chain 0	Chain 1
Channel 36	
	
Channel 44	
	
Channel 48	
	

IEEE 802.11ac-VHT40	
Chain 0	Chain 1
Channel 38	
	
Channel 46	
	

IEEE 802.11ac-VHT80	
Channel 42	
	

5.46 DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (e) RSS-247 Issue 2 Section 6.2.4.1
Test Method:	KDB 789033 D02 v02r01 Section C.2
Limit:	Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyzer according to the following Settings:

6dB 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.

Occupied Bandwidth

a) Set RBW = 1% to 5% of the occupied bandwidth
b) Set the video bandwidth (VBW) ≥ 3 x RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup:	Refer to section 4.5.3 for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Transmitter mode
Test Results:	Pass

Test Data:

Mode	Channel/ Frequency (MHz)	6 dB Bandwidth (MHz)		99% Bandwidth (MHz)		6 dB Bandwidth Limit	Pass / Fail
		Chain 0	Chain 1	Chain 0	Chain 1		
IEEE 802.11a	149 (5745)	16.35	16.37	18.343	17.736	> 500 kHz	Pass
	157 (5785)	16.36	15.93	18.403	17.532	> 500 kHz	Pass
	165 (5825)	16.32	16.36	18.187	17.504	> 500 kHz	Pass
IEEE 802.11n-HT20	149 (5745)	17.60	16.96	18.365	18.099	> 500 kHz	Pass
	157 (5785)	15.99	17.57	18.092	18.030	> 500 kHz	Pass
	165 (5825)	17.53	16.93	18.083	18.000	> 500 kHz	Pass
IEEE 802.11n-HT40	151 (5755)	35.36	35.03	37.328	36.579	> 500 kHz	Pass
	159 (5795)	35.07	34.17	36.577	36.430	> 500 kHz	Pass
IEEE 802.11ac-VHT20	149 (5745)	16.96	17.58	18.352	18.044	> 500 kHz	Pass
	157 (5785)	17.61	16.93	18.149	18.079	> 500 kHz	Pass
	165 (5825)	17.03	17.34	18.150	18.006	> 500 kHz	Pass
IEEE 802.11ac-VHT40	151 (5755)	35.36	35.36	37.533	36.835	> 500 kHz	Pass
	159 (5795)	34.87	35.21	36.538	36.479	> 500 kHz	Pass
IEEE 802.11ac-VHT80	155 (5775)	75.21	71.95	75.044	75.158	> 500 kHz	Pass