

MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac/ax

FCC ID: TE7AX11000

APPLICANT: TP-Link Technologies Co., Ltd.

Application Type: Certification

Product: AX11000 MU-MIMO Tri-Band Gaming Router

Model No.: Archer AX11000

Brand Name: tp-link

FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s): Part15 Subpart E (Section 15.407)

Test Procedure(s): ANSI C63.10-2013, KDB 789033 D02v02r01,
KDB 662911 D01v02r01

Test Date: November 23 ~ December 05, 2018

Reviewed By:



(Paddy Chen)

Approved By:



(Chenz Ker)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v02r01. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Taiwan) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1811TW0112-U4	Rev. 01	Initial report	12-05-2018	Valid

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§2.1033 General Information

Applicant:	TP-Link Technologies Co., Ltd.
Applicant Address:	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China
Manufacturer:	TP-Link Technologies Co., Ltd.
Manufacturer Address:	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)
FCC Registration No.:	291082
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- MRT facility is a FCC registered (Reg. No. 153292 and 291082) test facility with the site description report on file and is designated by the FCC as an Accredited Test Firm.
- MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.

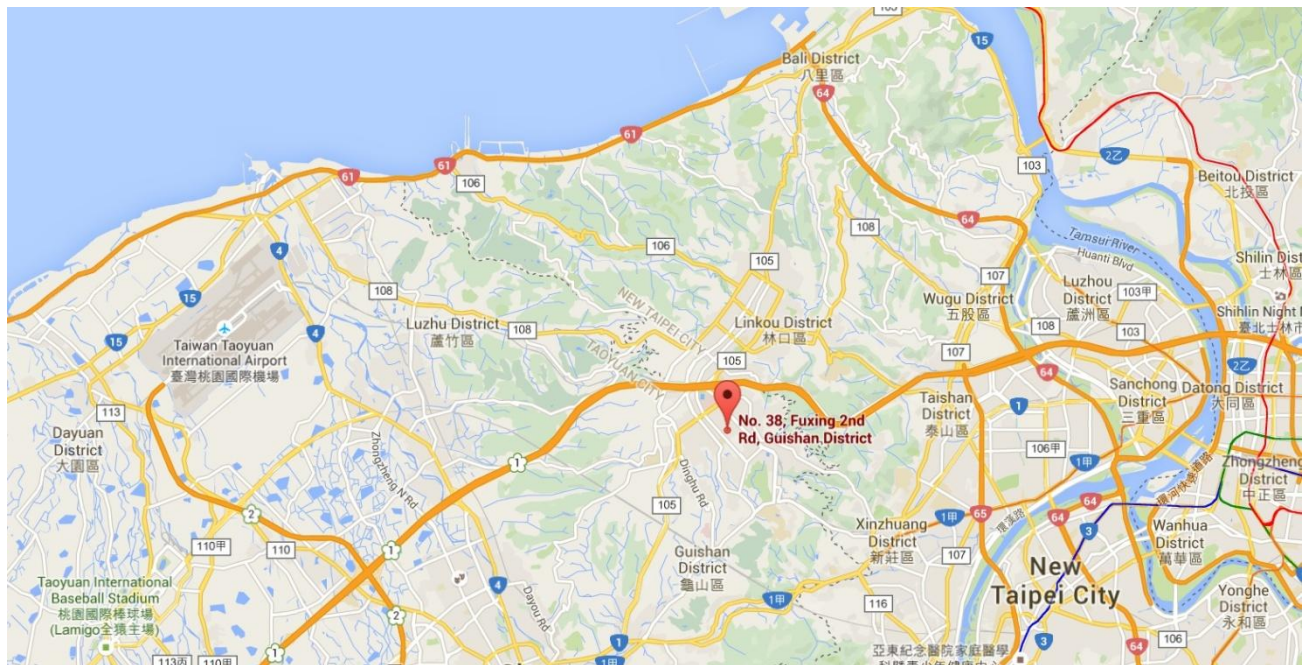
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	AX11000 MU-MIMO Tri-Band Gaming Router
Model No.:	Archer AX11000
Brand Name:	tp-link
Wi-Fi Specification:	802.11a/b/g/n/ac/ax
Bluetooth Specification:	v4.1 Dual mode
Accessories	
Adapter:	MODEL: S065PQ1200500 INPUT: 100 - 240V ~ 50/60Hz 1800mA OUTPUT: DC 12.0V 5000mA

2.2. Product Specification Subjective to this Report

Frequency Range:	For 802.11a/n-HT20/ac-VHT20/ax-HE20: 5180~5240MHz, 5260~5320MHz, 5500~5700MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40/ax-HE40: 5190~5230MHz, 5270~5310MHz, 5510~5670MHz, 5755~5795MHz For 802.11ac-VHT80/ax-HE80: 5210MHz, 5290MHz, 5530MHz, 5610 MHz, 5775MHz For 802.11ac-VHT160/ax-HE160: 5250MHz, 5570MHz
Type of Modulation:	802.11a/n/ac: OFDM 802.11ax:OFDMA
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 600Mbps 802.11ac: up to 4333Mbps 802.11ax: up to 4804Mbps

Note: For other features of this EUT, test report will be issued separately.

2.3. Working Frequencies for this report

802.11a/n-HT20/ac-VHT20/ax-HE20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

802.11n-HT40/ac-VHT40/ax-HE40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
151	5755 MHz	159	5795 MHz	--	--

802.11ac-VHT80/ax-HE80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	155	5775 MHz	--	--

802.11ac-VHT160/ax-HE160

Channel	Frequency	Channel	Frequency	Channel	Frequency
50	5250 MHz	114	5570 MHz	--	--

2.4. Description of Available Antennas

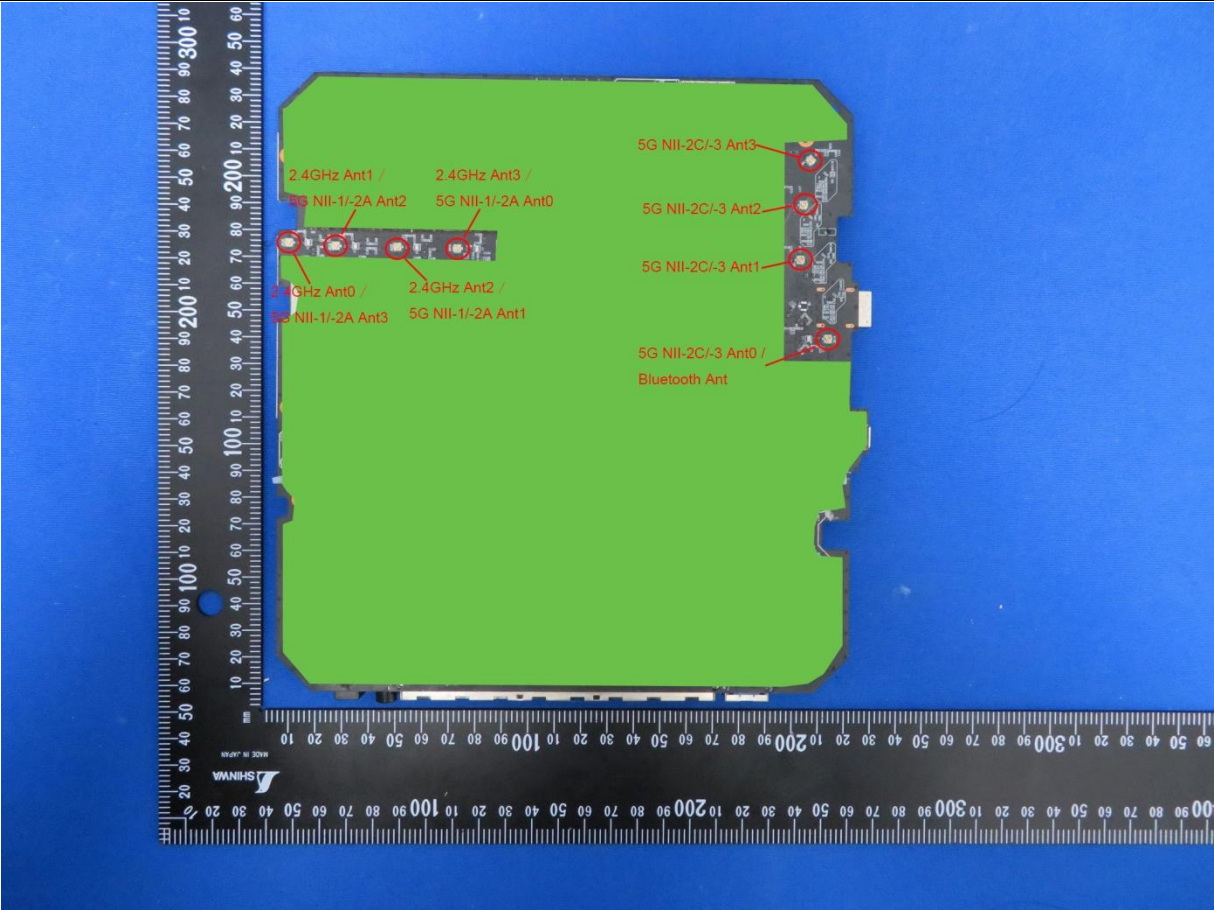
Antenna Type	Frequency	TX Paths	Max Antenna Gain (dBi)	BF Directional Gain (dBi)	CDD Directional Gain (dBi)	
	Band (MHz)				For Power	For PSD
Wi-Fi External Antenna						
Dipole Antenna	2400 ~ 2500	4	1.8	7.82	1.8	7.82
	5150 ~ 5850	4	1.8	7.82	1.8	7.82
Bluetooth External Antenna						
Dipole Antenna	2400 ~ 2500	1	1.8	--	--	--

Note:

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
For CDD transmissions, directional gain is calculated as follows, $N_{ANT} = 4$, $N_{SS} = 1$.
If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.
 - For power spectral density (PSD) measurements on all devices,
Array Gain = $10 \log (N_{ANT} / N_{SS})$ dB = 6.02;
 - For power measurements on IEEE 802.11 devices,
Array Gain = 0 dB for $N_{ANT} \leq 4$;
- The EUT also supports Beam Forming mode, and the Beam Forming support 802.11ac/ax, not include 802.11a/b/g/n. BF Directional gain = $G_{ANT} + 10 \log (N_{ANT})$.

2.5. Description of Antenna RF Port

Antenna RF Port												
Software Control Port	2.4GHz RF Port				5GHz RF Port (NII-1 & NII-2A)				Bluetooth & 5GHz RF Port (NII-2C & NII-3)			
	Ant 0	Ant 1	Ant 2	Ant 3	Ant 0	Ant 1	Ant 2	Ant 3	Ant 0 / BT	Ant 1	Ant 2	Ant 3



The photograph shows the antenna module with the following labels:

- 2.4GHz Ant1 / 5G NII-1/-2A Ant2
- 2.4GHz Ant3 / 5G NII-1/-2A Ant0
- 2.4GHz Ant0 / 5G NII-1/-2A Ant3
- 2.4GHz Ant2 / 5G NII-1/-2A Ant1
- 5G NII-2C/-3 Ant3
- 5G NII-2C/-3 Ant2
- 5G NII-2C/-3 Ant1
- 5G NII-2C/-3 Ant0 / Bluetooth Ant

2.6. Test Mode

Test Mode	Mode 1: Transmit by 802.11a (6Mbps) (CDD Mode)
	Mode 2: Transmit by 802.11n-HT20 (MCS0) (CDD Mode)
	Mode 3: Transmit by 802.11n-HT40 (MCS0) (CDD Mode)
	Mode 4: Transmit by 802.11ac-VHT20 (MCS0) (CDD Mode)
	Mode 5: Transmit by 802.11ac-VHT40 (MCS0) (CDD Mode)
	Mode 6: Transmit by 802.11ac-VHT80 (MCS0) (CDD Mode)
	Mode 7: Transmit by 802.11ac-VHT160 (MCS0) (CDD Mode)
	Mode 8: Transmit by 802.11ax-HE20 (MCS0) (CDD Mode)
	Mode 9: Transmit by 802.11 ax-HE40 (MCS0) (CDD Mode)
	Mode 10: Transmit by 802.11ax-HE80 (MCS0) (CDD Mode)
	Mode 11: Transmit by 802.11ax-HE160 (MCS0) (CDD Mode)
	Mode 12: Transmit by 802.11ac-VHT20 (MCS0) (BF Mode)
	Mode 13: Transmit by 802.11ac-VHT40 (MCS0) (BF Mode)
	Mode 14: Transmit by 802.11ac-VHT80 (MCS0) (BF Mode)
	Mode 15: Transmit by 802.11ac-VHT160 (MCS0) (BF Mode)
	Mode 16: Transmit by 802.11ax-HE20 (MCS0) (BF Mode)
	Mode 17: Transmit by 802.11 ax-HE40 (MCS0) (BF Mode)
	Mode 18: Transmit by 802.11ax-HE80 (MCS0) (BF Mode)
	Mode 19: Transmit by 802.11ax-HE160 (MCS0) (BF Mode)

2.7. Description of Test Software

The test utility software used during testing was “accessMTool”, and the version was “v3.1.0.1”.

Power Parameter Value:

Test Mode	Test Frequency (MHz)	Power Parameter Value	
		CDD Mode	Beamforming Mode
802.11a	5180	81	--
	5220	84	--
	5240	83	--
	5260	59	--
	5300	60	--
	5320	60	--
	5500	60	--
	5600	60.	--
	5700	61	--
	5745	95	--
	5785	95	--
	5825	96	--
802.11n-HT20	5180	82	--
	5220	85	--
	5240	85	--
	5260	60	--
	5300	62	--
	5320	60	--
	5500	61	--
	5600	60.	--
	5700	60	--
	5745	95	--
	5785	95	--
	5825	96	--

Test Mode	Test Frequency (MHz)	Power Parameter Value	
		CDD Mode	Beamforming Mode
802.11n-HT40	5190	74	--
	5230	90	--
	5270	71	--
	5310	72	--
	5510	72	--
	5590	72	--
	5670	72	--
	5755	95	--
	5795	95	--
802.11ac-VHT20	5180	82	82
	5220	85	85
	5240	84	84
	5260	60	60
	5300	62	62
	5320	60	60
	5500	60	60
	5600	60	60
	5700	61	61
	5745	94	92
	5785	94	92
	5825	94	92
802.11ac-VHT40	5190	76	76
	5230	90	89
	5270	72	66
	5310	72	66
	5510	72	67
	5590	72	67
	5670	72	67
	5755	95	88
	5795	95	88

Test Mode	Test Frequency (MHz)	Power Parameter Value	
		CDD Mode	Beamforming Mode
802.11ac-VHT80	5210	74	66
	5290	74	67
	5530	74	68
	5610	74	68
	5775	85	92
802.11ac-VHT160	5250	65	67
	5570	68	67
802.11ax-HE20	5180	81	81
	5220	84	84
	5240	83	83
	5260	60	60
	5300	60	60
	5320	61	61
	5500	60	60
	5600	60	60
	5700	60	60
	5745	93	92
	5785	93	91
	5825	94	92
802.11ax-HE40	5190	75	70
	5230	90	89
	5270	71	66
	5310	71	66
	5510	72	66
	5590	72	66
	5670	72	66
	5755	93	92
	5795	93	92

Test Mode	Test Frequency (MHz)	Power Parameter Value	
		CDD Mode	Beamforming Mode
802.11ax-HE80	5210	68	67
	5290	74	66
	5530	72	66
	5610	72	66
	5775	86	92
802.11ax-HE160	5250	68	66
	5570	72	66

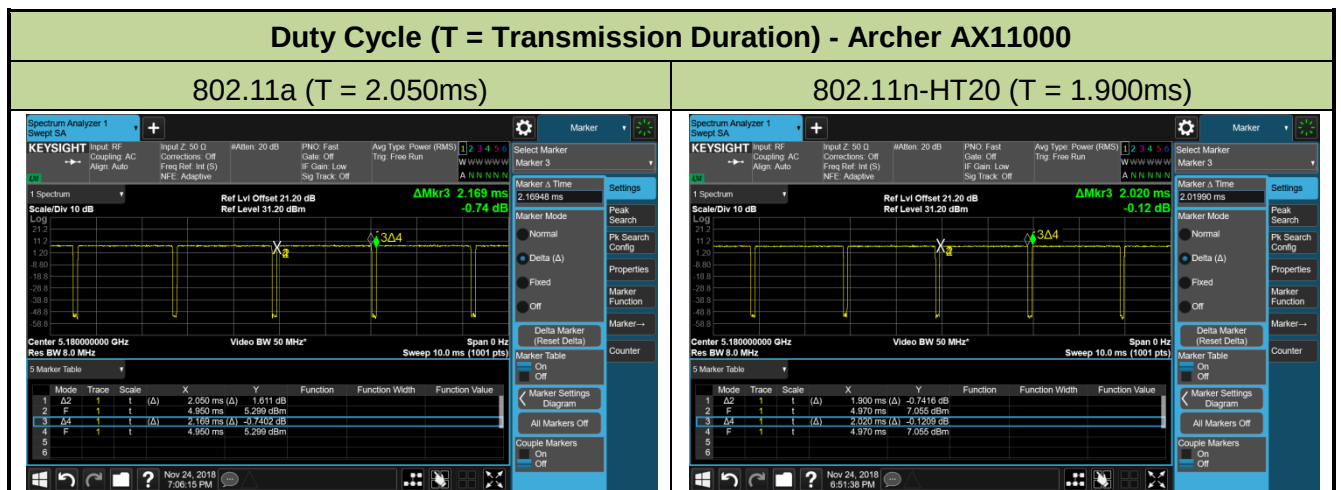
2.8. Device Capabilities

This device contains the following capabilities:

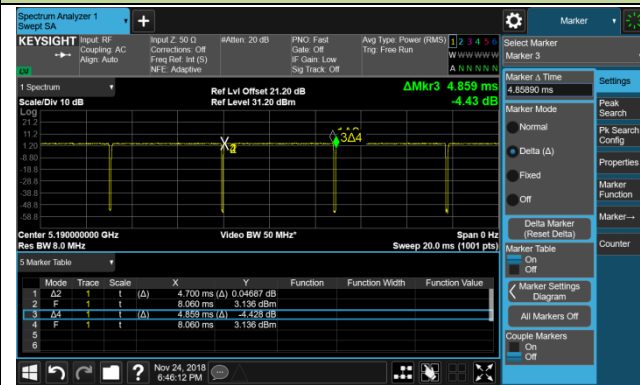
2.4GHz WLAN (DTS), 5GHz WLAN (UNII), Bluetooth v4.1 (Dual mode)

Note: 5GHz (NII) operation is possible in 20MHz, 40MHz, 80MHz and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz per the guidance of Section B)2)b) of KDB 789033 D02v02r01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

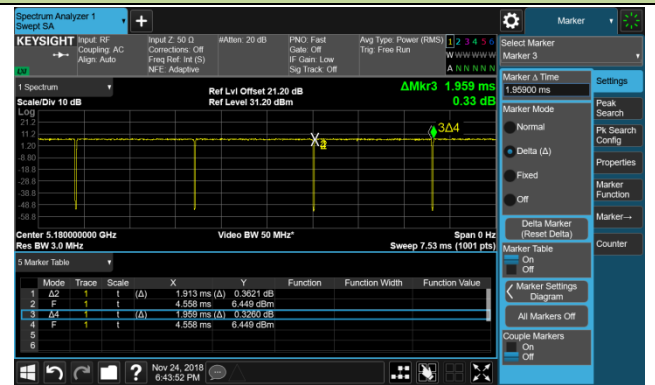
Test Mode	Duty Cycle
802.11a	94.51%
802.11n-HT20	94.06%
802.11n-HT40	96.73%
802.11ac-VHT20	97.65%
802.11ac-VHT40	98.45%
802.11ac-VHT80	96.48%
802.11ac-VHT160	96.60%
802.11ax-HE20	98.63%
802.11ax-HE40	97.53%
802.11ax-HE80	95.95%
802.11ax-HE160	87.91%



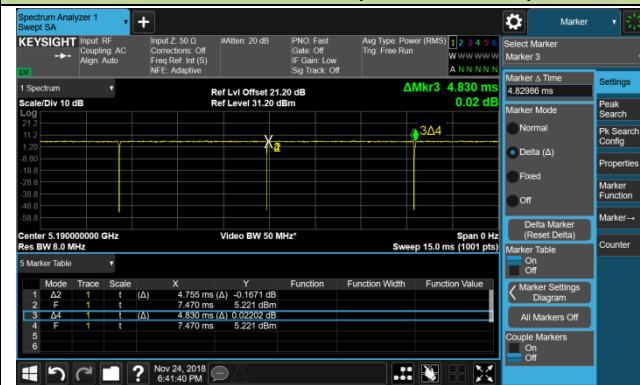
802.11n-HT40 (T = 4.700ms)



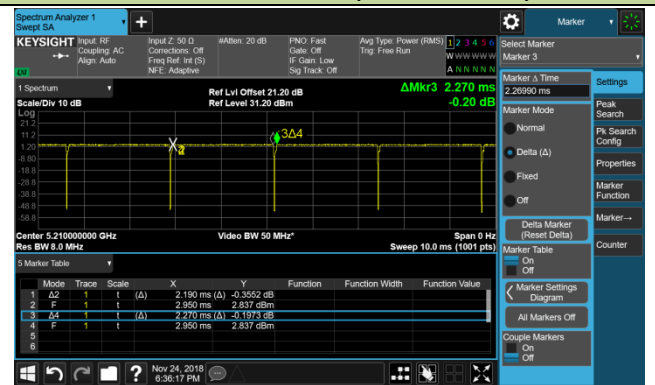
802.11ac-VHT20 (T = 1.913ms)



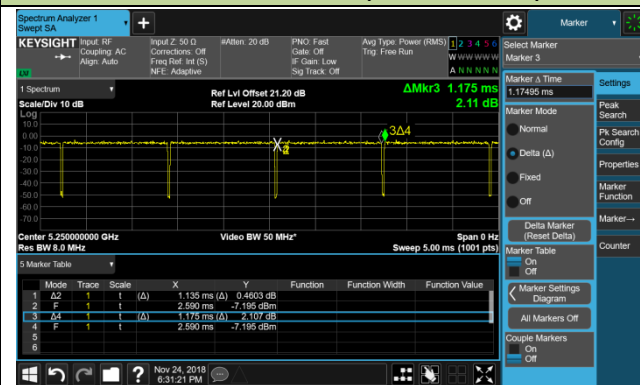
802.11ac-VHT40 (T = 4.755ms)



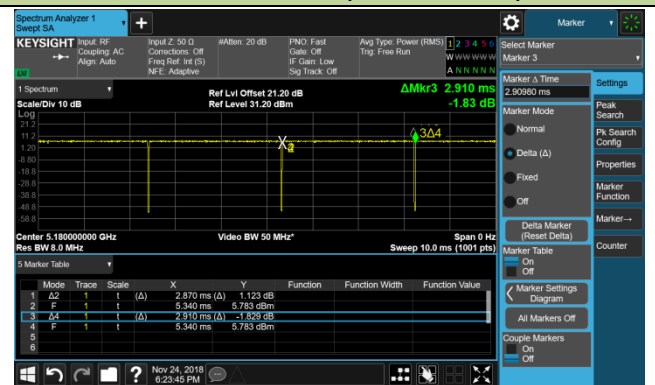
802.11ac-VHT80 (T = 2.190ms)



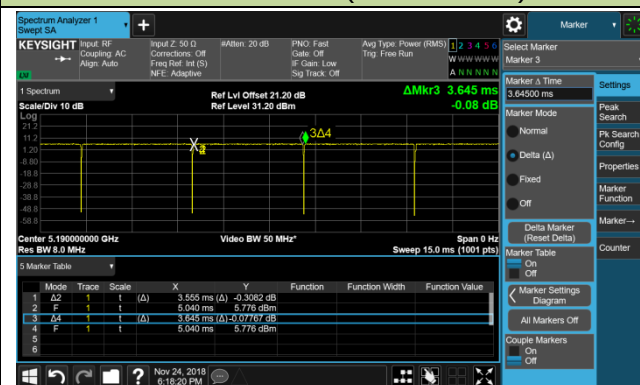
802.11ac-VHT160 (T = 1.135ms)



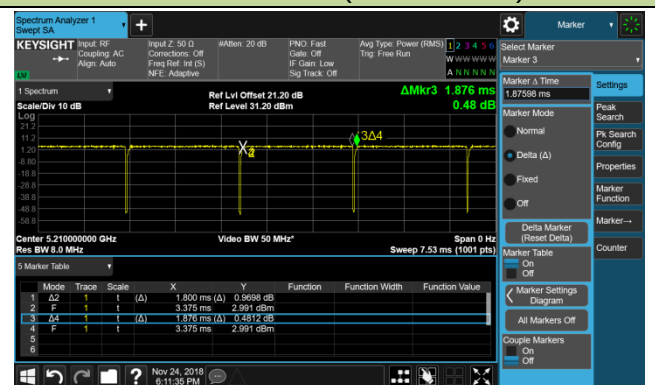
802.11ax-HE20 (T = 2.870ms)

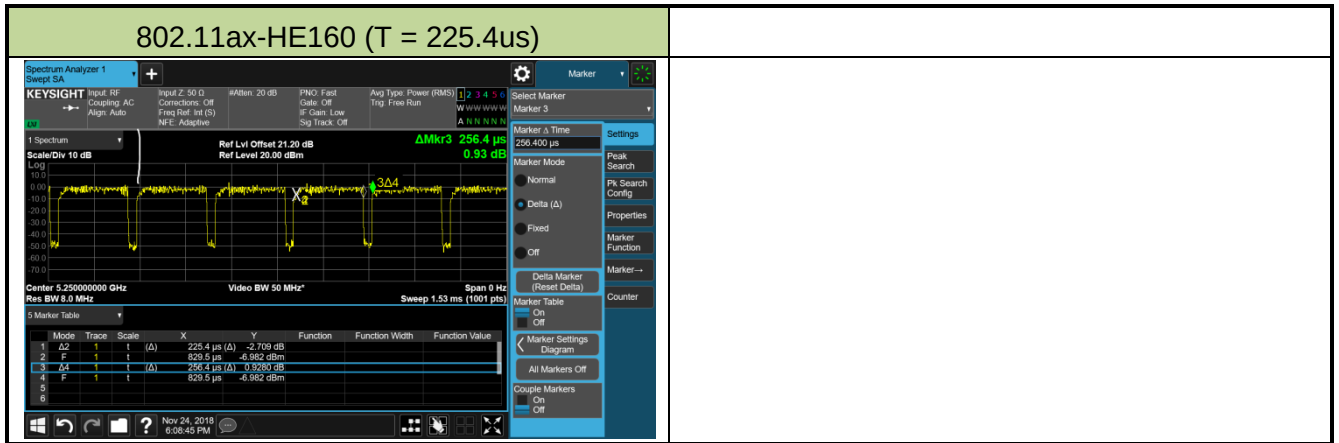


802.11ax-HE40 (T = 3.555ms)



802.11ax-HE80 (T = 1.800ms)





2.9. Test Configuration

The **AX11000 MU-MIMO Tri-Band Gaming Router** was tested per the guidance of KDB 789033 D02v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.10. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.11. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlets supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v02r01 were used in the measurement of the **AX11000 MU-MIMO Tri-Band Gaming Router**.

Deviation from measurement procedure.....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remotecontrolled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

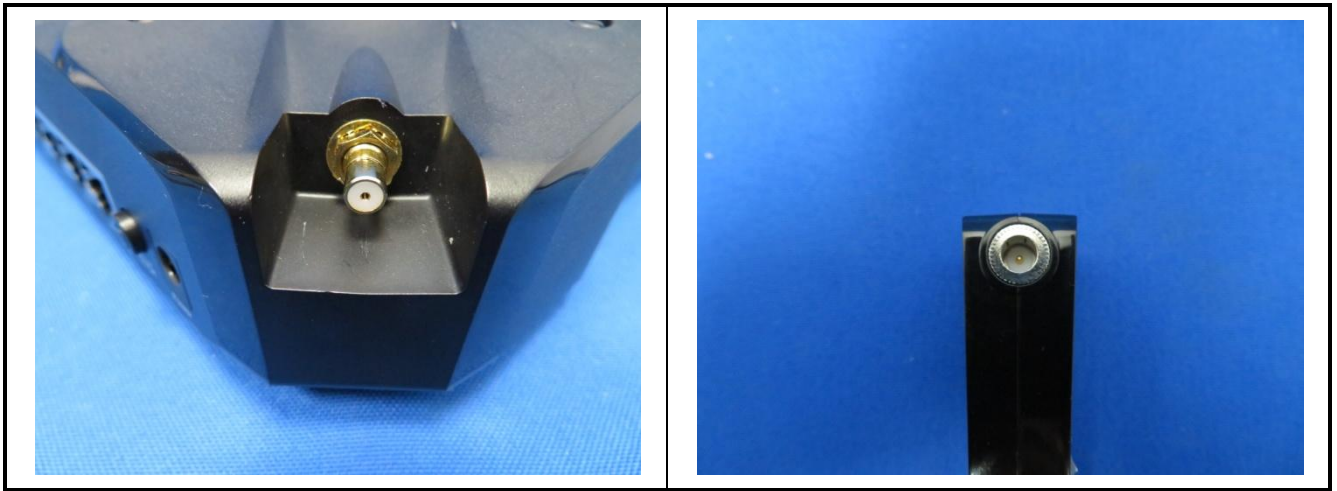
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.”

- The antenna of the **AX11000 MU-MIMO Tri-Band Gaming Router** uses a unique connector.



Conclusion:

The unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2019/3/20
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2019/3/20
8-Wire ISN (T8)	R&S	ENY81	MRTTWA00018	1 year	2019/4/24
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2019/5/14
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2019/5/21

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2019/4/24
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2019/5/22
Broadband Hornantenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2019/4/24
Breitband Hornantenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2019/4/23
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2019/4/23
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2019/4/23
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2019/3/19
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/7/30
Antenna Cable	HUBERSUHNER	SF106	MRTTWE00010	1 year	2019/5/18
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2019/5/21

Conducted Test Equipment - SR1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/7/30
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTSUE06457	1 year	2019/7/19
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00014	1 year	2019/4/24
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2019/5/21

Software	Version	Function
e3	V 8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT 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 $k = 2$.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 150kHz~30MHz: 2.53dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz ~ 1GHz: 4.25dB 1GHz ~ 25GHz: 4.45dB
Spurious Emissions, Conducted - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 2.65dB
Output Power - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.84dB
Power Spectrum Density - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 2.65dB
Occupied Bandwidth - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 3.3%

7. TEST RESULT

7.1. Summary

Product Name: AX11000 MU-MIMO Tri-Band Gaming Router

FCC ID: TE7AX11000

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 7.2
15.407(e)	6dB Bandwidth	$\geq 500\text{kHz}$		Pass	Section 7.3
15.407(a)(1)(ii), (2), (3)	Maximum Conducted Output Power	Refer to section 7.4		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	$\leq 24\text{ dBm}$		Pass	Section 7.5
15.407(a)(1)(ii), (2), (3), (5)	Peak Power Spectral Density	Refer to section 7.6		Pass	Section 7.6
15.407(g)	Frequency Stability	$\pm 20\text{ ppm}$		Pass	Section 7.7
15.407(b)(1), (4)(i)	Undesirable Emissions	Refer to Section 7.8	Radiated	Pass	Section 7.8 & 7.9
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits(Restricted Bands andRadiated Emission Limits)	Emissions in restrictedbands must meet theradiated limits detailed in15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.10

Notes:

- 1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 2) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- 3) Test Items “26dB Bandwidth” & “6dB Bandwidth” have been assessed MIMO transmission, and showed the worst test data in this report.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

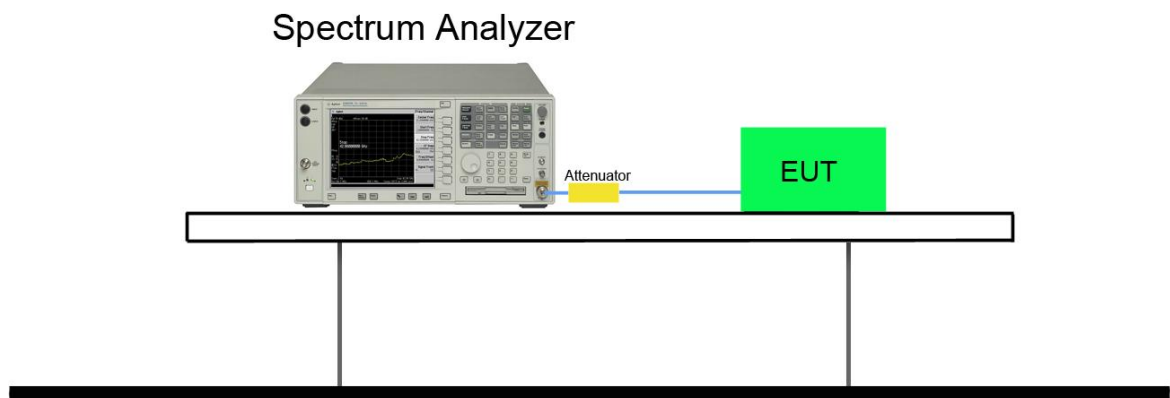
7.2.2. Test Procedure used

KDB 789033 D02v02r01 - Section C.1

7.2.3. Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 26$. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4. Test Setup



7.2.5. Test Result

Product	AX11000 MU-MIMO Tri-Band Gaming Router	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	SR1	Test Date	2018/11/25

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1 + 2 + 3					
802.11a	6Mbps	36	5180	21.09	16.76
802.11a	6Mbps	44	5220	21.15	16.73
802.11a	6Mbps	48	5240	21.25	16.71
802.11a	6Mbps	52	5260	21.03	16.71
802.11a	6Mbps	60	5300	21.18	16.74
802.11a	6Mbps	64	5320	21.23	16.72
802.11a	6Mbps	100	5500	21.19	16.75
802.11a	6Mbps	120	5600	21.18	16.75
802.11a	6Mbps	140	5700	21.19	16.74
802.11a	6Mbps	149	5745	20.93	16.68
802.11a	6Mbps	157	5785	21.06	16.69
802.11a	6Mbps	165	5825	21.34	16.76
802.11n-HT20	MCS0	36	5180	21.53	17.89
802.11n-HT20	MCS0	44	5220	21.55	17.89
802.11n-HT20	MCS0	48	5240	21.43	17.90
802.11n-HT20	MCS0	52	5260	21.48	17.89
802.11n-HT20	MCS0	60	5300	21.46	17.92
802.11n-HT20	MCS0	64	5320	21.50	17.91
802.11n-HT20	MCS0	100	5500	21.55	17.92
802.11n-HT20	MCS0	120	5600	21.51	17.92
802.11n-HT20	MCS0	140	5700	21.43	17.93
802.11n-HT20	MCS0	149	5745	21.19	17.88
802.11n-HT20	MCS0	157	5785	21.51	17.90
802.11n-HT20	MCS0	165	5825	21.47	17.92

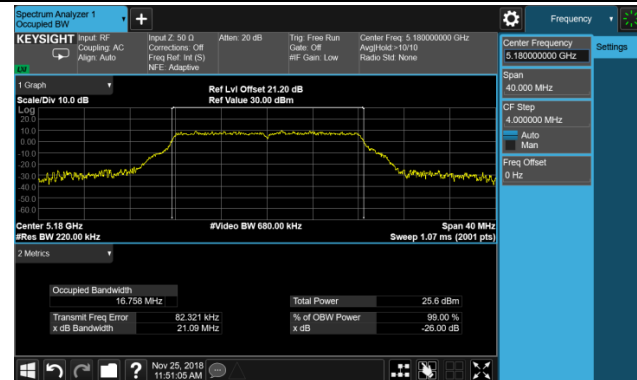
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1 + 2 + 3					
802.11n-HT40	MCS0	38	5190	39.74	36.27
802.11n-HT40	MCS0	46	5230	39.90	36.29
802.11n-HT40	MCS0	54	5270	39.76	36.26
802.11n-HT40	MCS0	62	5310	39.62	36.28
802.11n-HT40	MCS0	102	5510	39.84	36.29
802.11n-HT40	MCS0	118	5590	39.87	36.28
802.11n-HT40	MCS0	134	5670	39.59	36.29
802.11n-HT40	MCS0	151	5755	39.72	36.33
802.11n-HT40	MCS0	159	5795	39.91	36.33
802.11ac-VHT20	MCS0	36	5180	21.30	17.86
802.11ac-VHT20	MCS0	44	5220	21.17	17.84
802.11ac-VHT20	MCS0	48	5240	21.23	17.81
802.11ac-VHT20	MCS0	52	5260	21.19	17.84
802.11ac-VHT20	MCS0	60	5300	21.30	17.82
802.11ac-VHT20	MCS0	64	5320	21.35	17.81
802.11ac-VHT20	MCS0	100	5500	21.16	17.83
802.11ac-VHT20	MCS0	120	5600	21.36	17.82
802.11ac-VHT20	MCS0	140	5700	21.19	17.82
802.11ac-VHT20	MCS0	149	5745	21.46	17.86
802.11ac-VHT20	MCS0	157	5785	21.22	17.87
802.11ac-VHT20	MCS0	165	5825	21.29	17.90
802.11ac-VHT40	MCS0	38	5190	39.23	36.26
802.11ac-VHT40	MCS0	46	5230	39.53	36.26
802.11ac-VHT40	MCS0	54	5270	39.37	36.24
802.11ac-VHT40	MCS0	62	5310	39.21	36.20
802.11ac-VHT40	MCS0	102	5510	39.39	36.26
802.11ac-VHT40	MCS0	118	5590	39.74	36.28
802.11ac-VHT40	MCS0	134	5670	39.79	36.28
802.11ac-VHT40	MCS0	151	5755	39.93	36.33
802.11ac-VHT40	MCS0	159	5795	39.58	36.35

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1 + 2 + 3					
802.11ac-VHT80	MCS0	42	5210	80.52	75.75
802.11ac-VHT80	MCS0	58	5290	80.31	75.63
802.11ac-VHT80	MCS0	106	5530	81.75	75.89
802.11ac-VHT80	MCS0	122	5610	80.74	75.69
802.11ac-VHT80	MCS0	155	5775	81.47	75.69
802.11ac-VHT160	MCS0	50	5250	161.70	154.67
802.11ac-VHT160	MCS0	114	5570	163.40	154.27
802.11ax-HE20	MCS0	36	5180	21.38	19.09
802.11ax-HE20	MCS0	44	5220	21.65	19.09
802.11ax-HE20	MCS0	48	5240	21.28	19.01
802.11ax-HE20	MCS0	52	5260	21.53	18.99
802.11ax-HE20	MCS0	60	5300	21.38	19.09
802.11ax-HE20	MCS0	64	5320	21.31	19.01
802.11ax-HE20	MCS0	100	5500	21.06	19.01
802.11ax-HE20	MCS0	120	5600	21.32	19.01
802.11ax-HE20	MCS0	140	5700	21.35	19.01
802.11ax-HE20	MCS0	149	5745	21.32	19.04
802.11ax-HE20	MCS0	157	5785	21.48	19.03
802.11ax-HE20	MCS0	165	5825	22.49	19.06
802.11ax-HE40	MCS0	38	5190	39.55	37.55
802.11ax-HE40	MCS0	46	5230	39.83	36.32
802.11ax-HE40	MCS0	54	5270	39.26	37.63
802.11ax-HE40	MCS0	62	5310	39.91	37.57
802.11ax-HE40	MCS0	102	5510	39.74	37.52
802.11ax-HE40	MCS0	118	5590	39.78	37.62
802.11ax-HE40	MCS0	134	5670	39.60	37.60
802.11ax-HE40	MCS0	151	5755	39.61	37.64
802.11ax-HE40	MCS0	159	5795	39.96	37.72

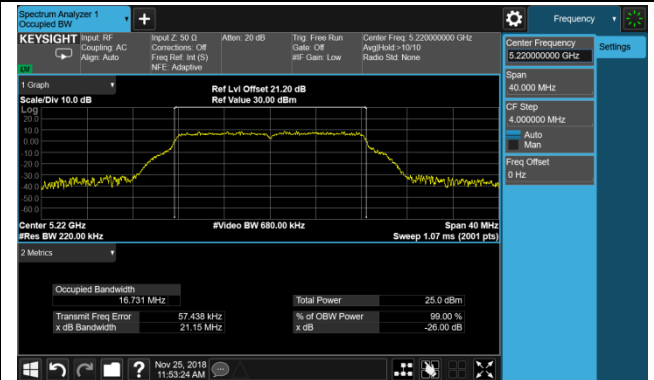
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1 + 2 + 3					
802.11ax-HE80	MCS0	42	5210	80.94	77.16
802.11ax-HE80	MCS0	58	5290	80.38	77.10
802.11ax-HE80	MCS0	106	5530	80.83	77.19
802.11ax-HE80	MCS0	122	5610	80.62	77.09
802.11ax-HE80	MCS0	155	5775	81.22	77.25
802.11ax-HE160	MCS0	50	5250	163.20	155.80
802.11ax-HE160	MCS0	114	5570	162.90	155.74

802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

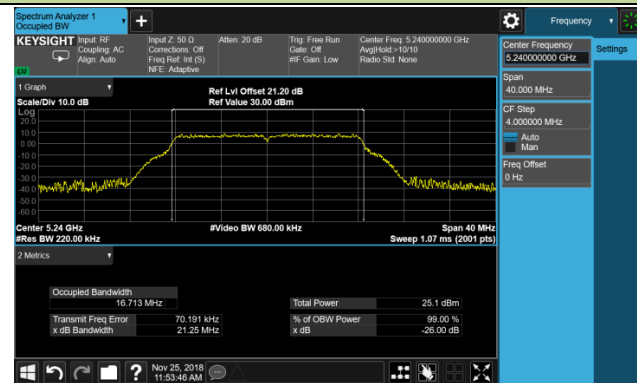
Channel 36 (5180MHz)



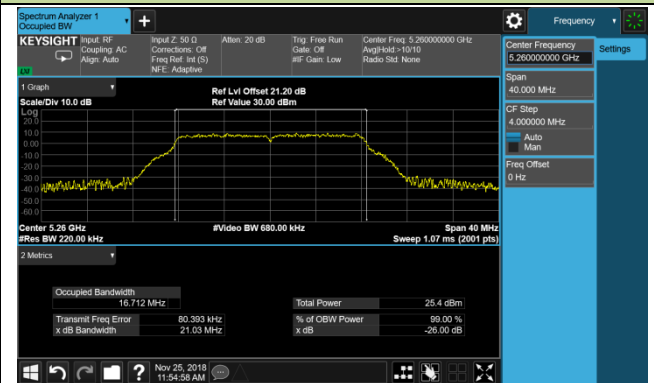
Channel 44 (5220MHz)



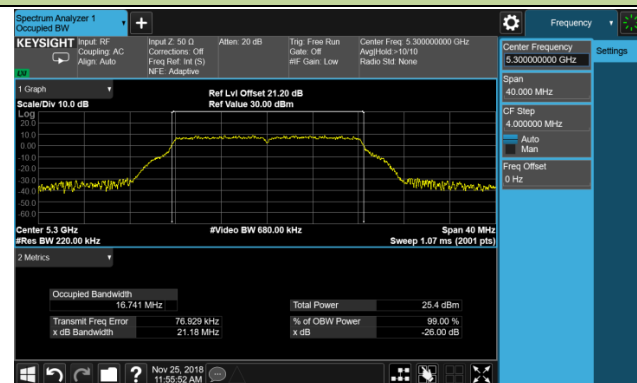
Channel 48 (5240MHz)



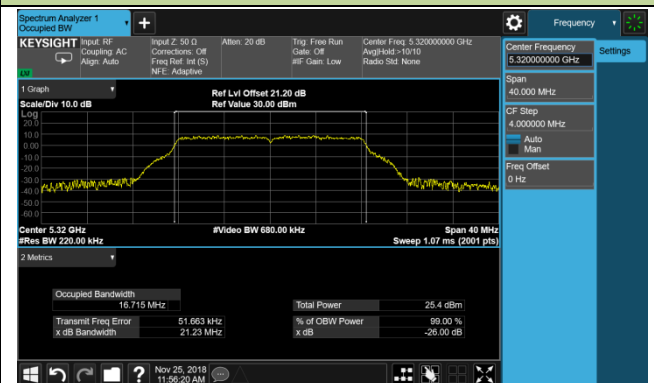
Channel 52 (5260MHz)



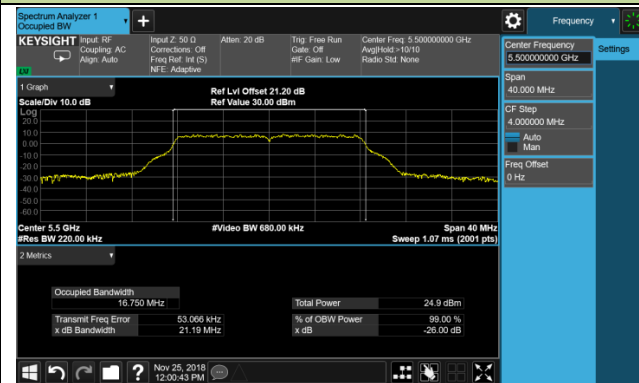
Channel 60 (5300MHz)



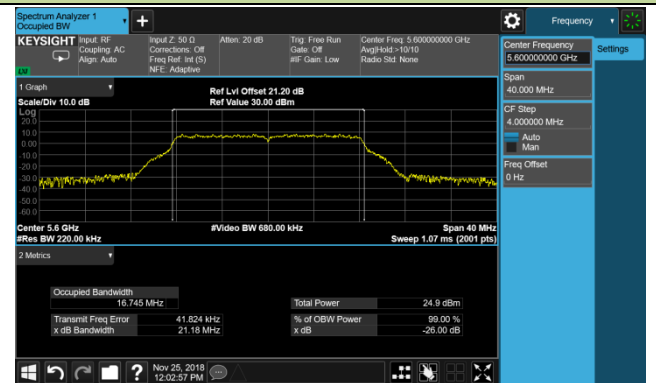
Channel 64 (5320MHz)



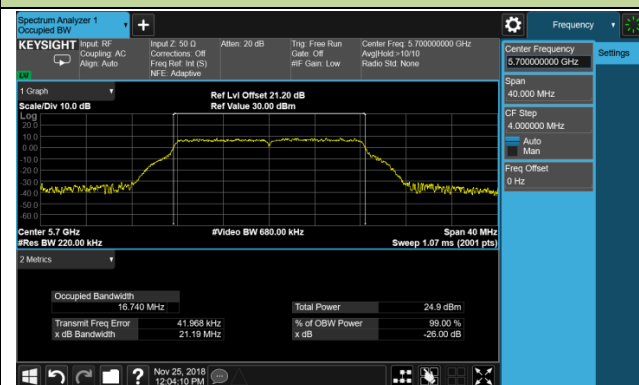
Channel 100 (5500MHz)



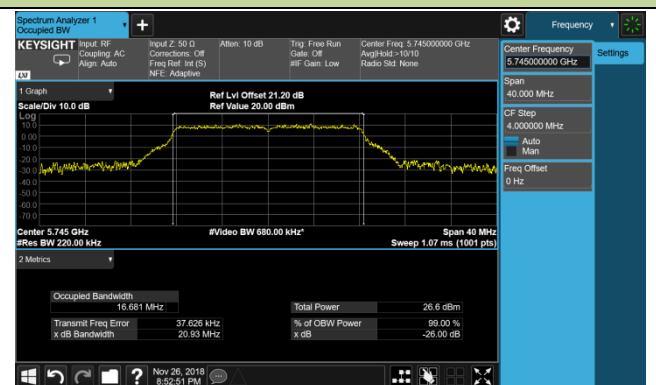
Channel 120 (5600MHz)



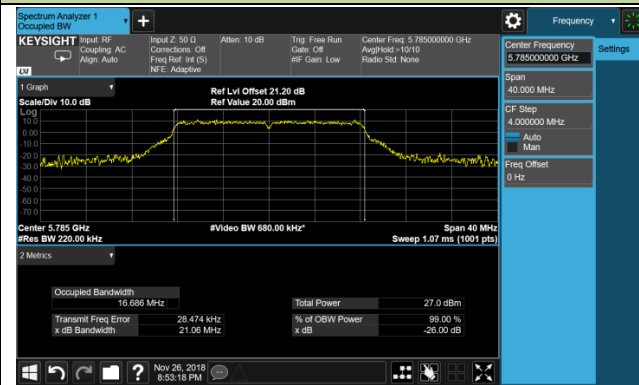
Channel 140 (5700MHz)



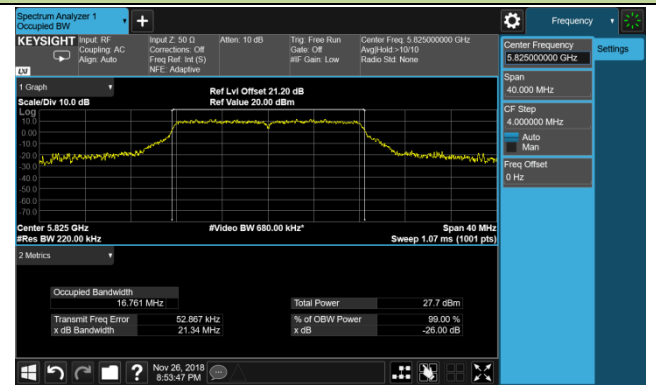
Channel 149 (5745MHz)



Channel 157 (5785MHz)

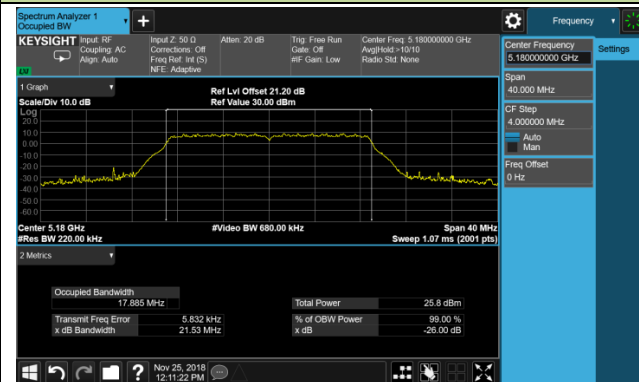


Channel 165 (5825MHz)

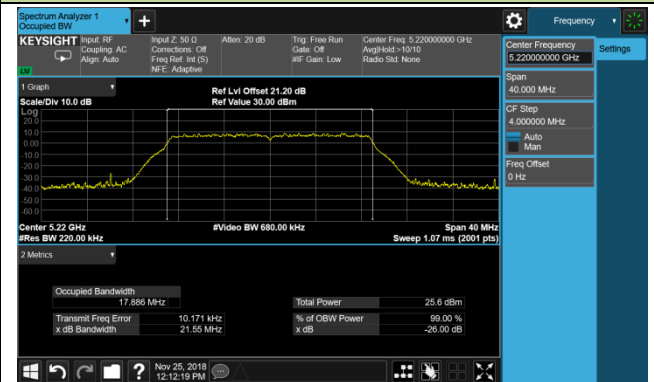


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

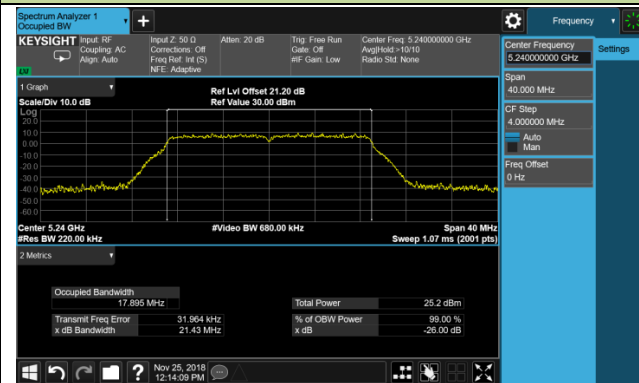
Channel 36 (5180MHz)



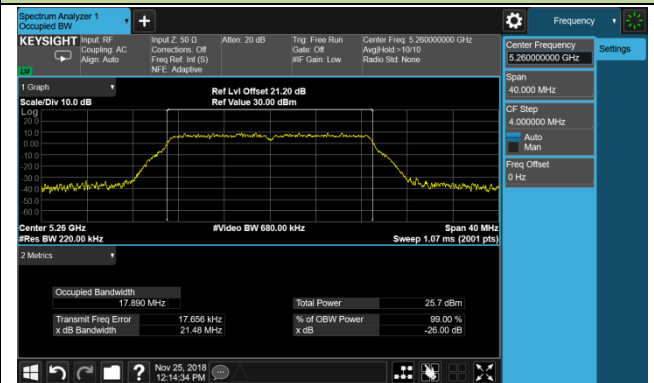
Channel 44 (5220MHz)



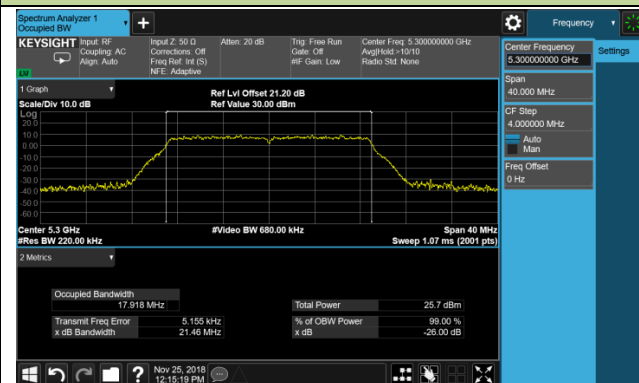
Channel 48 (5240MHz)



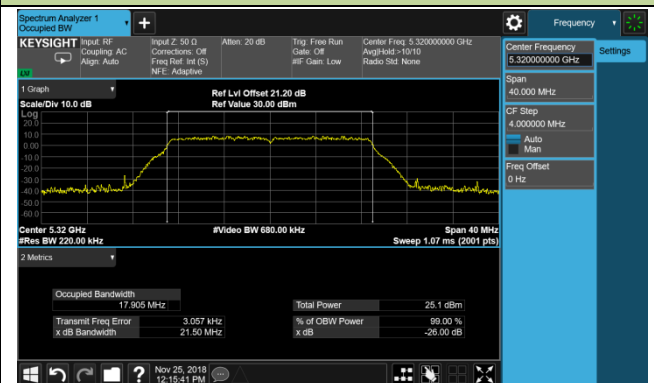
Channel 52 (5260MHz)

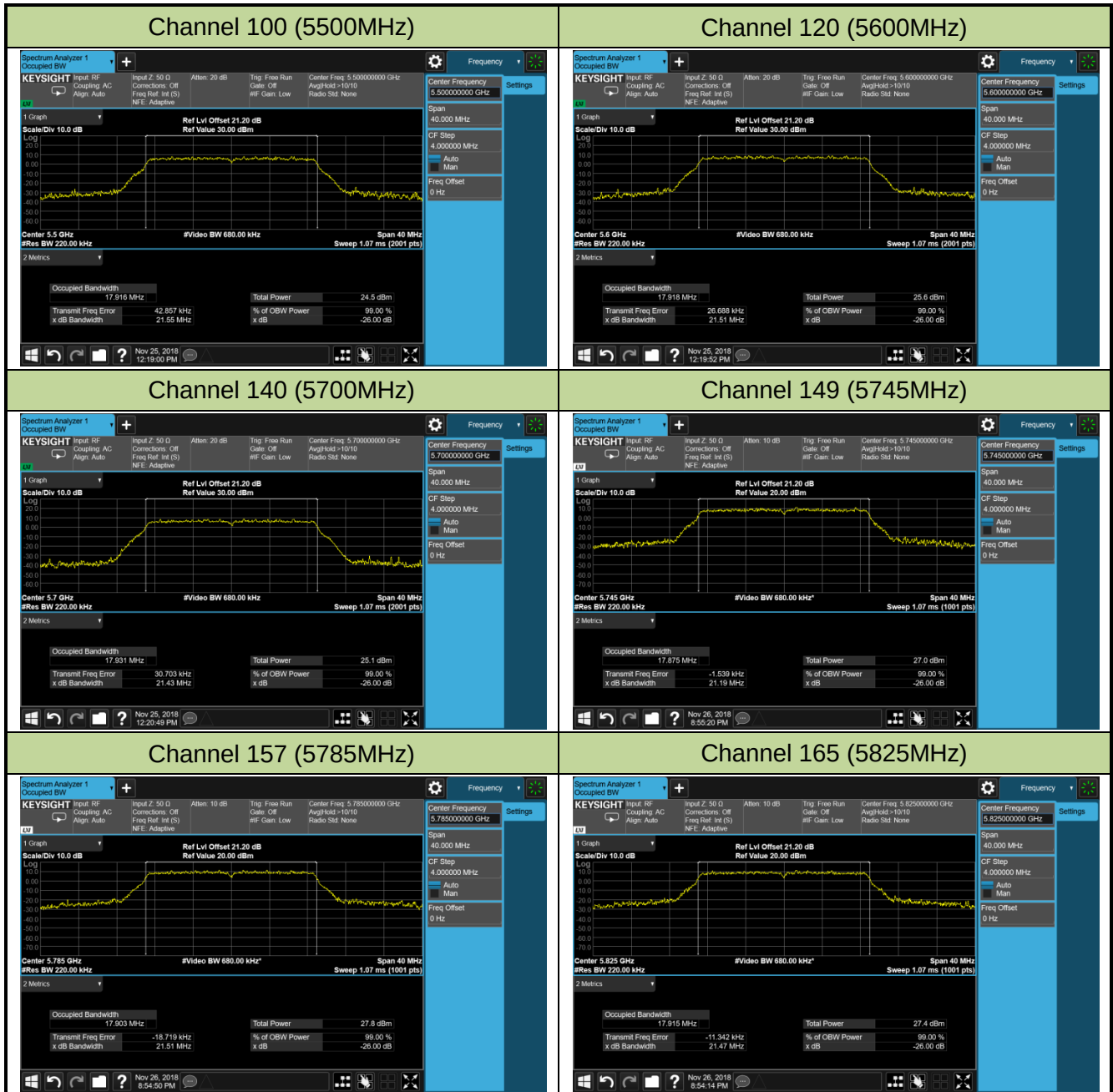


Channel 60 (5300MHz)



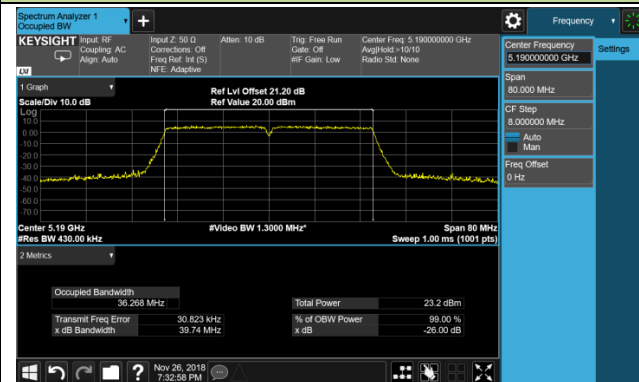
Channel 64 (5320MHz)



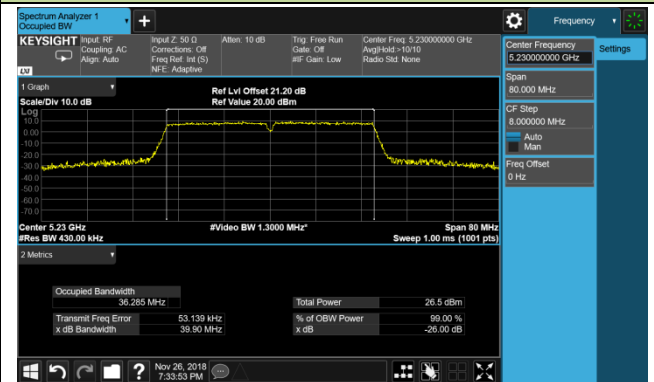


802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

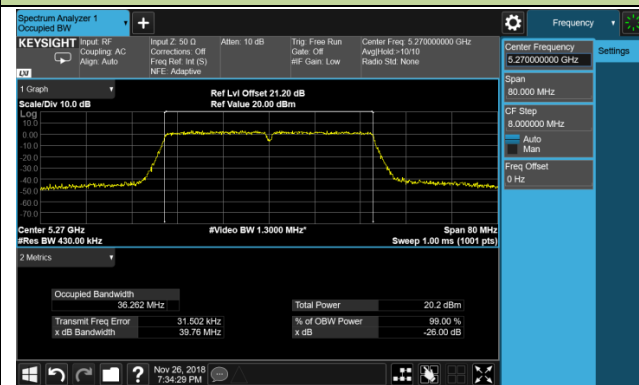
Channel 38 (5190MHz)



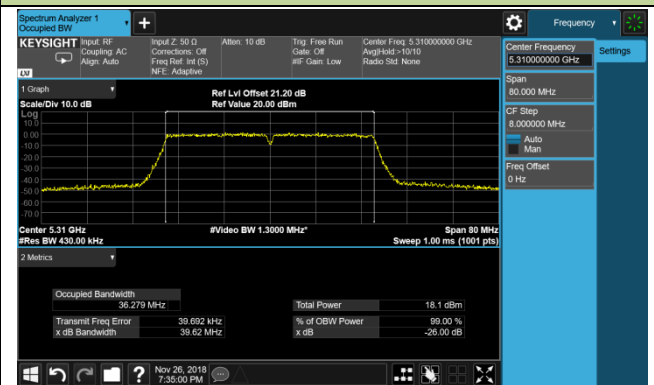
Channel 46 (5230MHz)



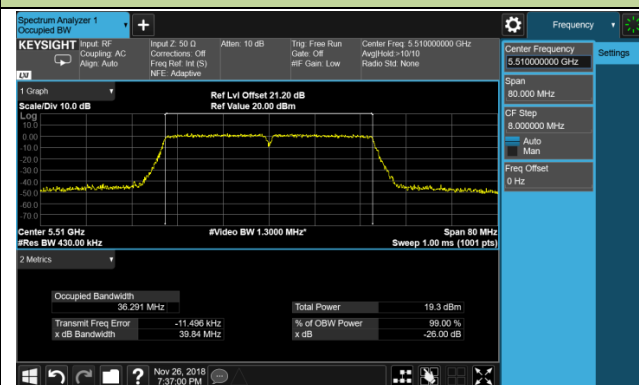
Channel 54 (5270MHz)



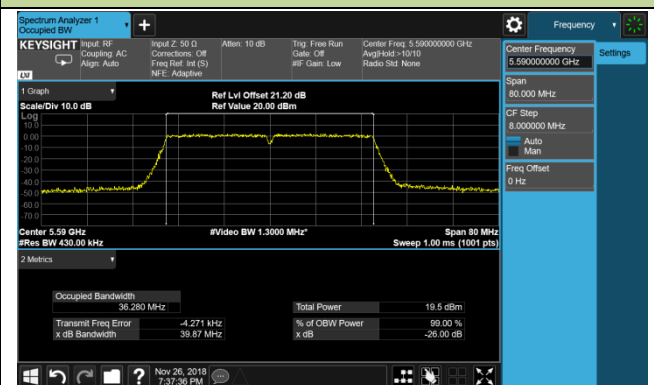
Channel 62 (5310MHz)

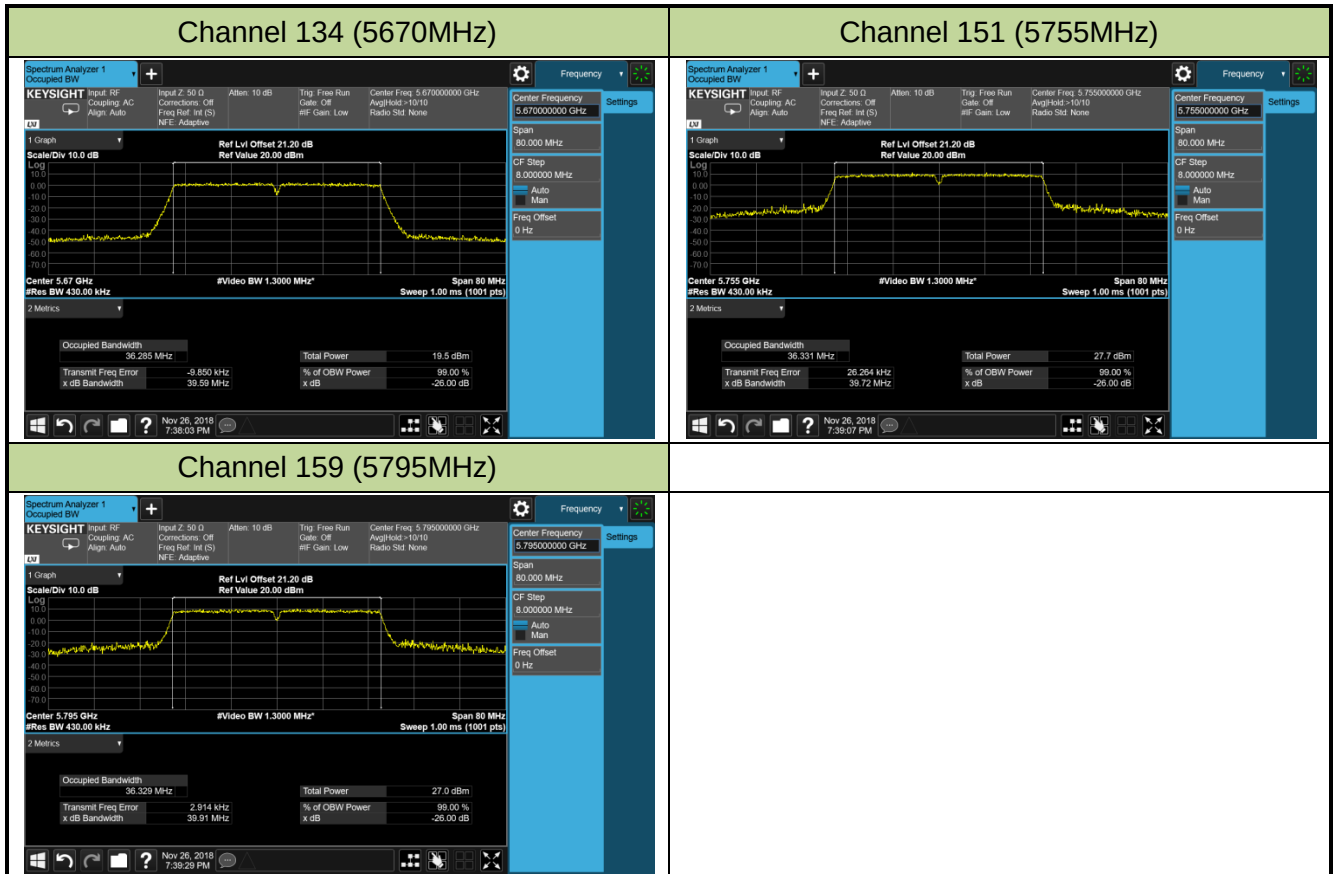


Channel 102 (5510MHz)



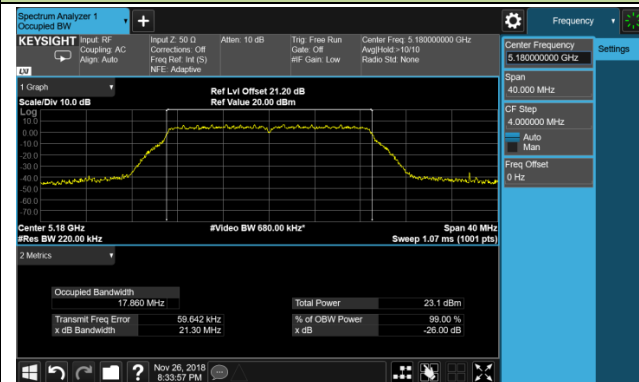
Channel 118 (5590MHz)



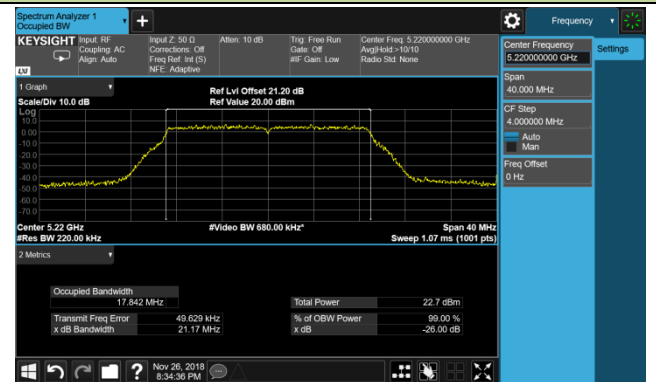


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

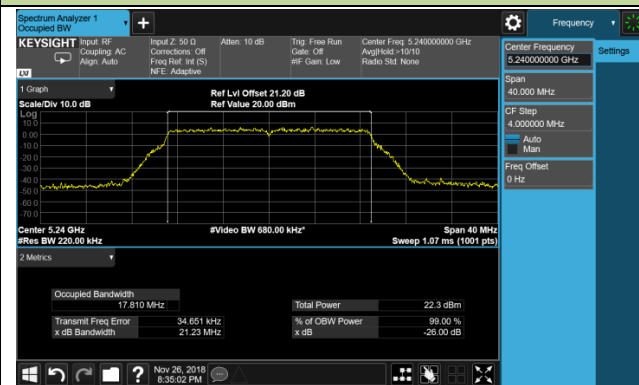
Channel 36 (5180MHz)



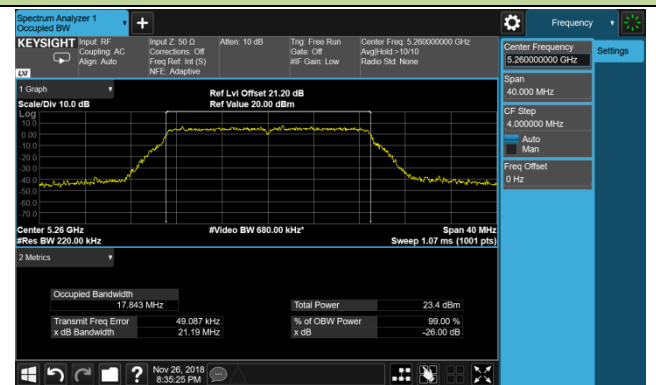
Channel 44 (5220MHz)



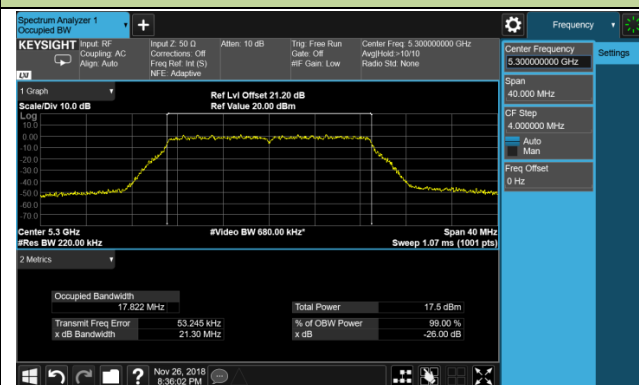
Channel 48 (5240MHz)



Channel 52 (5260MHz)



Channel 60 (5300MHz)



Channel 64 (5320MHz)

