

MEASUREMENT REPORT

FCC 15.407 WLAN 802.11a/n/ac/ax

FCC ID: 2ABLK-BLASTU4X

APPLICANT: Calix Inc.

Application Type: CLASS II PERMISSIVE CHANGE

Product: GigaSpire BLAST u4, GigaSpire Mesh BLAST u4m

Model No.: GigaSpire BLAST u4, GigaSpire Mesh BLAST u4m

Brand Name: 

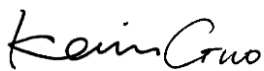
FCC Classification: Unlicensed National Information Infrastructure (NII)

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

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

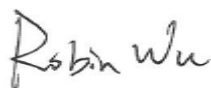
Test Date: July 01 ~ August 21, 2020

Reviewed By:



(Kevin Guo)

Approved By:



(Robin Wu)



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 (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2006RSU066-U5	Rev. 01	Initial report	09-17-2020	Valid

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General Information

Applicant:	Calix Inc.
Applicant Address:	1035 N. McDowell Blvd Petaluma, CA94954 U.S.A
Manufacturer:	Calix Inc.
Manufacturer Address:	1035 N. McDowell Blvd Petaluma, CA94954 U.S.A
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is an FCC accredited testing laboratory (MRT Designation No. CN1166) on the FCC website.
- MRT facility is an ISED recognized testing laboratory (MRT Reg. No. CN0001) on the ISED website.
- MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the A2LA under the A2LA Program (Cert. No. 3628.01) and CNAS under the CNAS Program (Cert. No. L10551) in EMC, Safety, Radio, Telecommunications and SAR testing.

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 Innovation, Science and Economic Development Canada and Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



2. PRODUCT INFORMATION

Product Name:	GigaSpire BLAST u4, GigaSpire Mesh BLAST u4m
Model No.:	GigaSpire BLAST u4, GigaSpire Mesh BLAST u4m
Brand Name:	
Wi-Fi Specification:	802.11a/b/g/n/ac/ax/VHT
Serial No.:	262007039756 (Radiated Emission & AC Line Conducted Emission) 262007039695 (Conducted)
Accessory	
Switching Mode Power Adapter:	MODEL: F24L9-120200SPAU INPUT: 100-240V~50/60Hz 0.6A OUTPUT: 12V=2A

Note: Between the models, there are the same schematics design, same PCB layout and the same RF parameters except the difference as below (Section 2.2), and GigaSpire BLAST u4 was selected for all RF test.

2.1. Models Difference

Model name	Difference
GigaSpire BLAST u4	2 LAN ports, 1 WAN port, 1 USB, 2.4G/5G Wi-Fi, external PSU
GigaSpire Mesh BLAST u4m	1 WAN port, 2.4G/5G Wi-Fi, external PSU

2.2. Product Specification Subjective to this Report

Frequency Range:	For 802.11a/n-HT20/ac-VHT20/ax-HE20: 5180~5240MHz, 5260~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40/ax-HE40: 5190~5230MHz, 5270~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80/ax-HE80: 5210MHz, 5290MHz, 5530MHz, 5610 MHz, 5690MHz, 5775MHz
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 300Mbps 802.11ac: up to 866.6Mbps 802.11ax: up to 1201Mbps

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	144	5720 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
142	5710 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	138	5690 MHz	155	5775 MHz

2.4. Description of Available Antennas

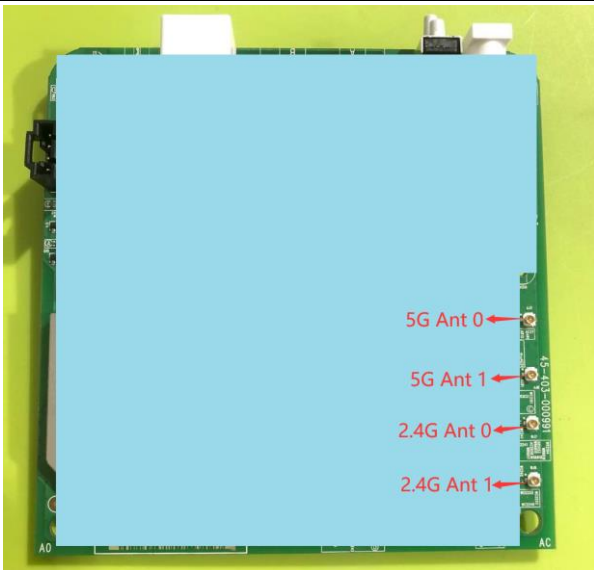
Model name	Manufacturer	Tx Port	Frequency Band (MHz)	Cable length (mm)
2.4G-2_PCB-LY70FC1	CHANGSHU HONGBO TELECOMMUNICATION TECHNOLOGY CO., LTD.	2.4G Ant 0	2412~2462	70
2.4G-1_PCB-LE160FC3		2.4G Ant 1	2412~2462	160
RFPCA252302IM5B301	WALSIN TECHNOLOGY CORPORATION	5G Ant 0	5150~5850	30
RFPCA252312IM5B301		5G Ant 1	5150~5850	125

Antenna Type	Frequency Band (MHz)	Tx Paths	Directional Gain (dBi)
			CDD & Beamforming
PCB Antenna	2412 ~ 2462	2	5.84
	5150 ~ 5350	2	5.81
	5470 ~ 5725	2	5.93
	5725 ~ 5850	2	5.95

Note 1: The EUT supports Cyclic Delay Diversity (CDD) and Beamforming technology, and the Beamforming mode support 802.11ac/ax, not include 802.11a/b/g. It transmits signals that are correlated, then Directional gain = $10 \log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.

Note 2: All the messages as above are provided by manufacturer.

2.5. Description of Antenna RF Port

Antenna RF Port				
Software Control Port	2.4GHz RF Port		5GHz RF Port	
	Ant 0	Ant 1	Ant 0	Ant 1
				

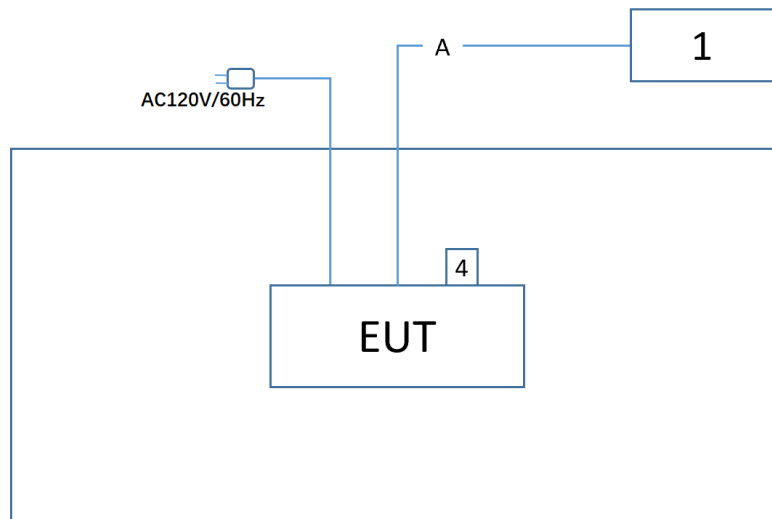
2.6. Test Mode

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 802.11ax-HE20 (MCS0) (CDD Mode)
	Mode 8: Transmit by 802.11ax-HE40 (MCS0) (CDD Mode)
	Mode 9: Transmit by 802.11ax-HE80 (MCS0) (CDD Mode)
	Mode 10: Transmit by 802.11ac-VHT20 (MCS0) (Beamforming Mode)
	Mode 11: Transmit by 802.11ac-VHT40 (MCS0) (Beamforming Mode)
	Mode 12: Transmit by 802.11ac-VHT80 (MCS0) (Beamforming Mode)
	Mode 13: Transmit by 802.11ax-HE20 (MCS0) (Beamforming Mode)
	Mode 14: Transmit by 802.11 ax-HE40 (MCS0) (Beamforming Mode)
	Mode 15: Transmit by 802.11ax-HE80 (MCS0) (Beamforming Mode)

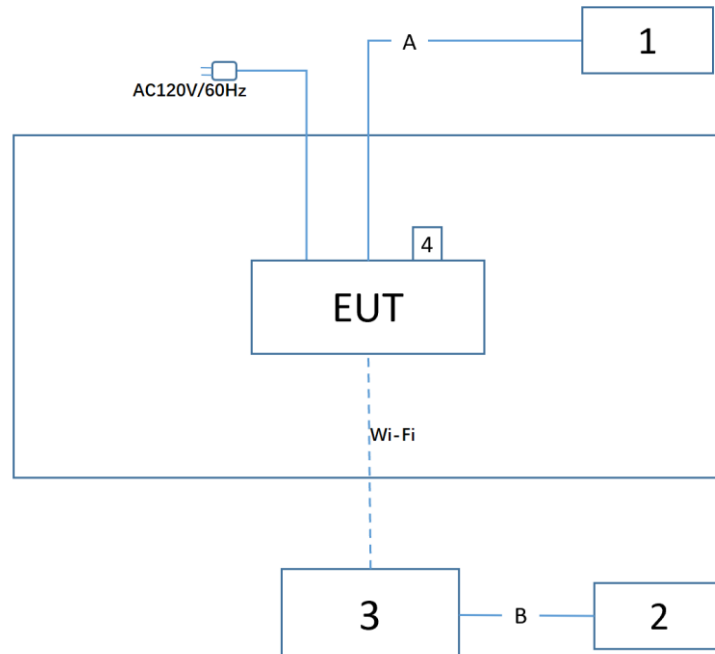
2.7. Configuration of Test System

The measurement procedures and appropriate EUT setup described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and KDB 789033 were used in the measurement.

Connection Diagram – Radiated Emission testing (CDD mode) & AC Conducted Emissions



Connection Diagram – Radiated Emission testing (Beamforming mode)



Signal Cable Type		Signal Cable Description
A	LAN Cable	Non shielded, > 10m
B	LAN Cable	Non shielded, 3.0m

2.8. Test System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook	Lenovo	E431	PF-10ZRN 13/12	Non-Shielded, 1.8m
2 Notebook	Lenovo	X230i	N/A	Non-Shielded, 1.8m
3 Station Device	Calix	GigaSpire BLAST u4	N/A	N/A
4 USB flash disk	SanDisk	CZ48	N/A	N/A

2.9. Description of Test Software

For CDD mode:

The test utility software used during testing was “Qualcomm Radio Control Tool”, and the version was “4.0.00132.0”.

For Beamforming mode:

Conducted measurement

The test utility software used during testing was “Qualcomm Radio Control Tool”, and the version was “4.0.00132.0”.

Radiated measurement

- 1) Configure EUT and station device to under the normal operation.
- 2) Set and fix EUT’s mode, channel, and power by telnet.
- 3) Connect EUT with station device, run “*lperf.exe*” to transmit and receive packet continuously by station device.

Note: Final power setting please refer to operational description.

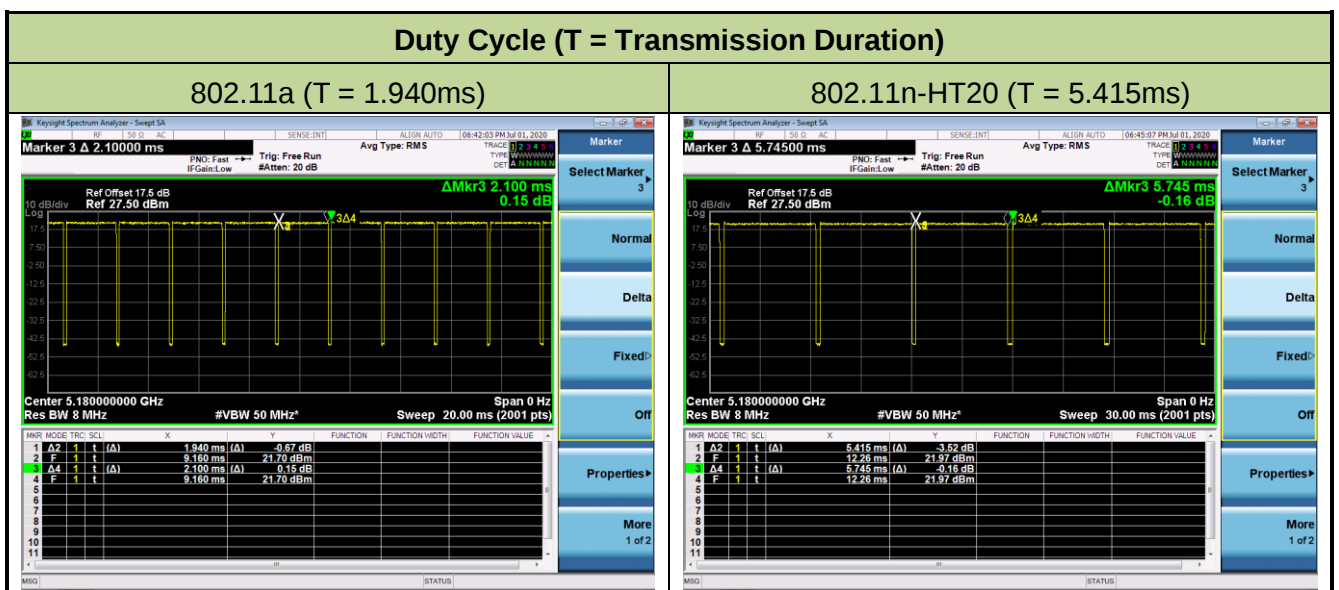
2.10. Test Environment Condition

Ambient Temperature	15°C~35°C
Relative Humidity	20%RH ~75%RH

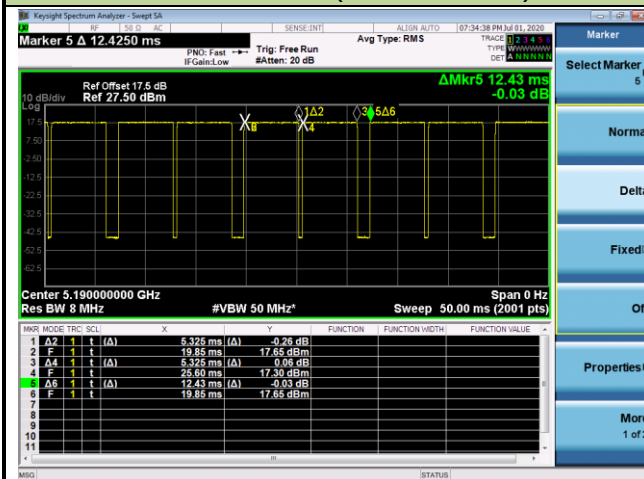
2.11. Duty Cycle

5GHz (NII) operation is possible in 20MHz, 40MHz and 80MHz 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. 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:

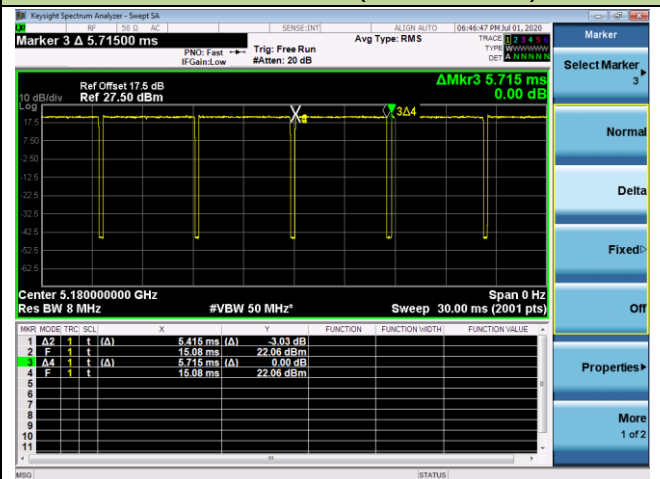
Test Mode	Duty Cycle
802.11a	92.38%
802.11n-HT20	94.26%
802.11n-HT40	85.68%
802.11ac-VHT20	94.75%
802.11ac-VHT40	85.08%
802.11ac-VHT80	94.50%
802.11ax-HE20	94.50%
802.11ax-HE40	95.50%
802.11ax-HE80	91.45%



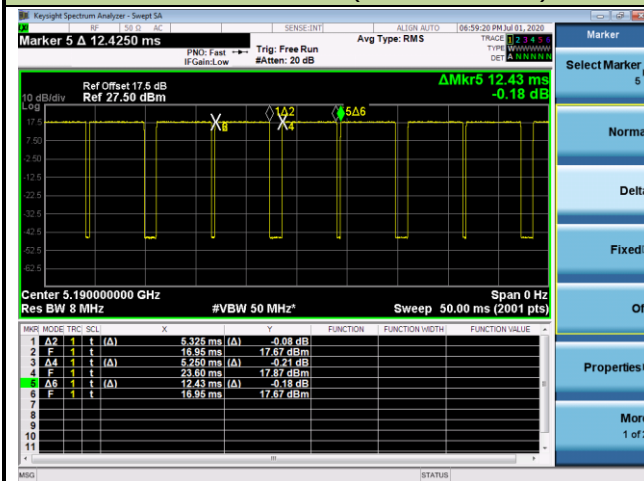
802.11n-HT40 (T = 10.650ms)



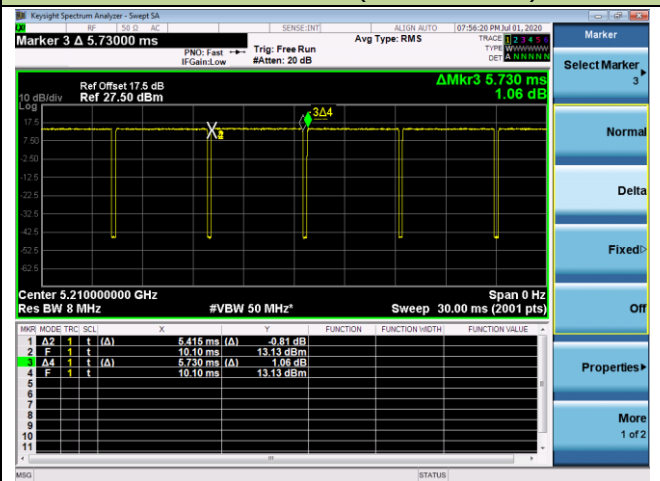
802.11ac-VHT20 (T = 5.415ms)



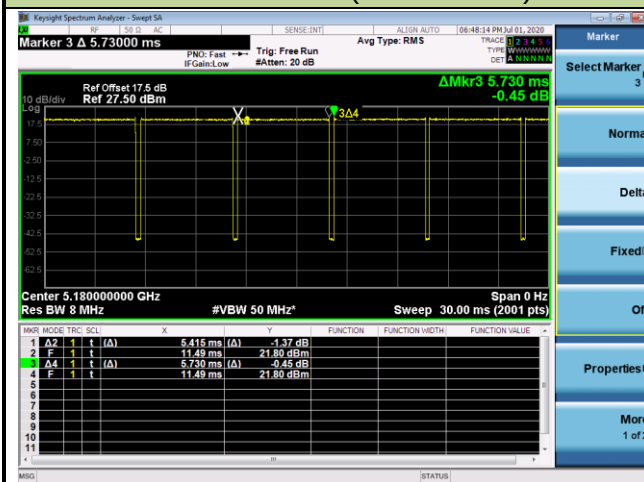
802.11ac-VHT40 (T = 10.575ms)



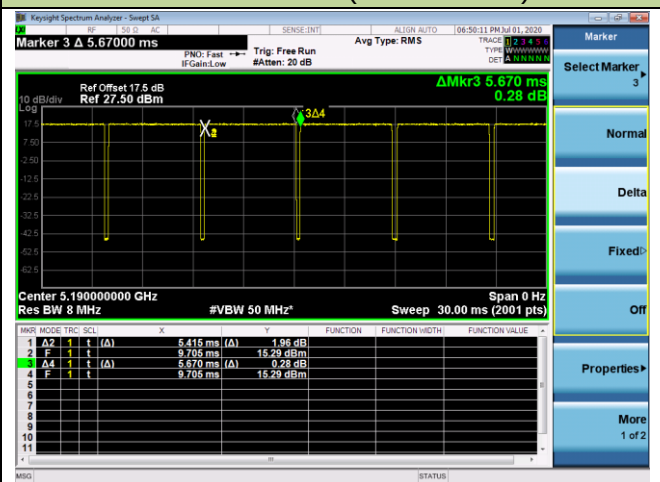
802.11ac-VHT80 (T = 5.415ms)

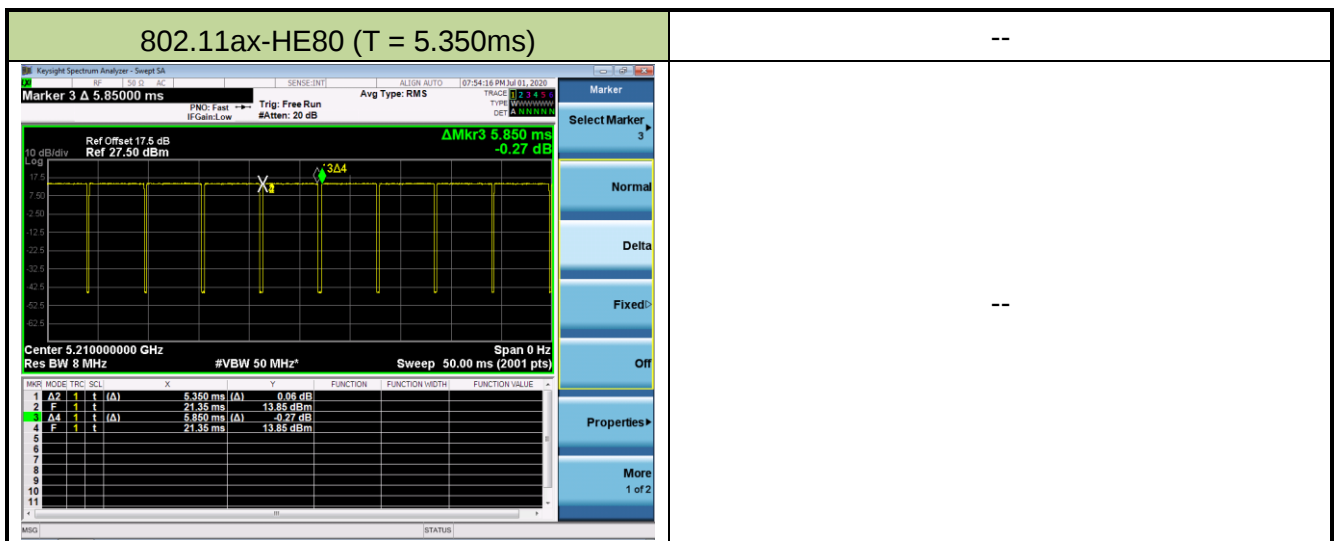


802.11ax-HE20 (T = 5.415ms)



802.11ax-HE40 (T = 5.415ms)





2.12. EMI Suppression Device(s)/Modifications

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

2.13. 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. 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 device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2021/01/18
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2021/06/11
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2021/06/11
Thermal Hygrometer	testo	608-H1	MRTSUE06404	1 year	2021/07/26

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/01/18
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2020/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/13
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/04/03
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2020/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2020/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	testo	608-H1	MRTSUE06403	1 year	2021/07/26
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2021/07/02
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/13
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2020/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2020/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2020/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2021/01/08
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2020/11/18
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/06/11
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/06/11
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/11
Modulation Analyzer	HP	8901A	MRTSUE06098	1 year	2020/10/10
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Attenuator	MVE	6dB	MRTSUE06534	1 year	2020/12/12
Attenuator	MVE	10dB	MRTSUE06543	1 year	2020/12/12
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2020/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/07/26

Software	Version	Function
EMI Software	V3	EMI Test Software

5. 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 $k = 2$.

Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): Horizontal: 9KHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~6GHz: 6.40dB Vertical: 9KHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.28%

6. TEST RESULT

6.1. Summary

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 6.2
15.407(a)(2)	Maximum Conducted Output Power	Refer to Section 6.4		Pass	Section 6.3
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 6.4
15.407(a)(2)	Peak Power Spectral Density	Refer to Section 6.5		Pass	Section 6.5
15.407(g)	Frequency Stability	± 20 ppm		Pass	Section 6.6
15.407(b)(2), (3)	Undesirable Emissions	Refer to Section 6.7	Radiated	Pass	Section 6.7 & 6.8
15.205, 15.209 15.407(b)(7), (8), (9)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 6.9

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) Output power test was verified over all data rates of each mode (data refers to operational description), and then choose the maximum power output (low data rate) for final test of each channel.
- 3) 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.
- 4) Test Items "26dB Bandwidth" & "6dB Bandwidth" showed the worst test data in this report.
- 5) EUT supports one configuration only in 802.11ax full RU mode, i.e. 242 tone in 11ax-HE20, 484 tone in 11ax-HE40 and 996 tone in 11ax-HE80.

6.2. 26dB Bandwidth Measurement

6.2.1. Test Limit

N/A

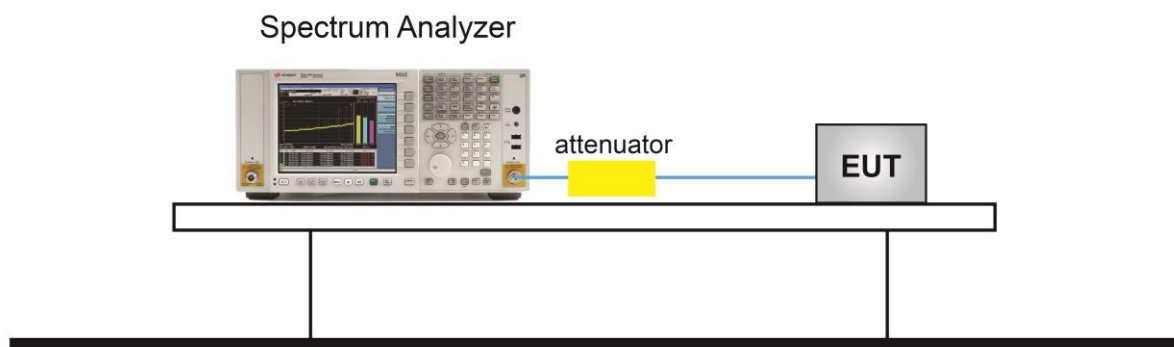
6.2.2. Test Procedure used

KDB 789033 D02v02r01 - Section C.1

6.2.3. 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.

6.2.4. Test Setup



6.2.5. Test Result

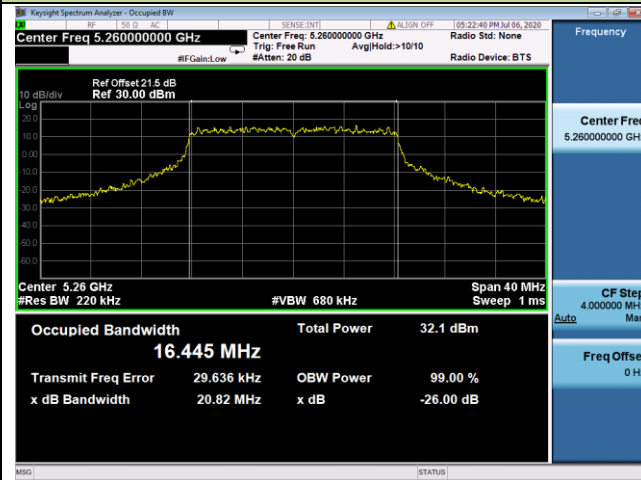
Product	GigaSpire BLAST u4	Test Engineer	Yuri Li
Test Date	2020/07/06~2020/07/08	Test Site	TR3

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1					
802.11a	6Mbps	52	5260	20.82	16.45
802.11a	6Mbps	60	5300	20.54	16.42
802.11a	6Mbps	64	5320	20.83	16.42
802.11a	6Mbps	100	5500	20.73	16.38
802.11a	6Mbps	116	5580	20.38	16.39
802.11a	6Mbps	140	5700	20.43	16.39
802.11a	6Mbps	144	5720	20.42	16.37
802.11n-HT20	MCS0	52	5260	19.85	17.48
802.11n-HT20	MCS0	60	5300	19.83	17.45
802.11n-HT20	MCS0	64	5320	20.31	17.47
802.11n-HT20	MCS0	100	5500	19.94	17.47
802.11n-HT20	MCS0	116	5580	19.87	17.44
802.11n-HT20	MCS0	140	5700	19.93	17.42
802.11n-HT20	MCS0	144	5720	19.73	17.41
802.11n-HT40	MCS0	54	5270	40.36	36.09
802.11n-HT40	MCS0	62	5310	40.28	36.08
802.11n-HT40	MCS0	102	5510	40.57	36.10
802.11n-HT40	MCS0	110	5550	40.55	36.07
802.11n-HT40	MCS0	134	5670	40.43	36.10
802.11n-HT40	MCS0	142	5710	40.47	36.10
802.11ac-VHT20	MCS0	52	5260	20.92	17.55
802.11ac-VHT20	MCS0	60	5300	20.45	17.57
802.11ac-VHT20	MCS0	64	5320	20.55	17.57
802.11ac-VHT20	MCS0	100	5500	19.94	17.37
802.11ac-VHT20	MCS0	116	5580	19.78	17.38
802.11ac-VHT20	MCS0	140	5700	20.14	17.43
802.11ac-VHT20	MCS0	144	5720	19.53	17.42

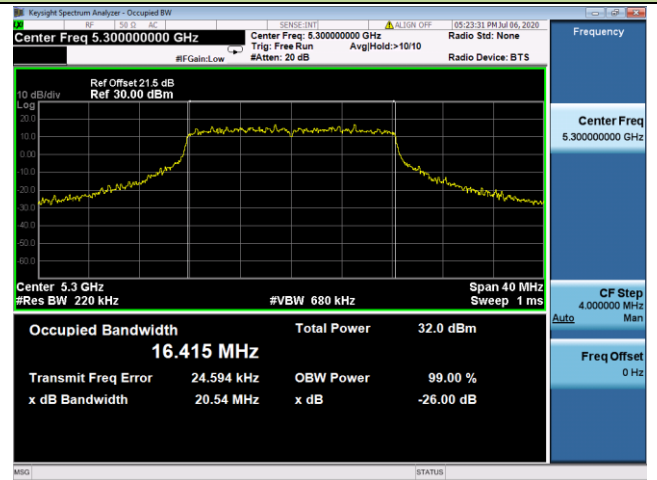
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1					
802.11ac-VHT40	MCS0	54	5270	40.49	36.11
802.11ac-VHT40	MCS0	62	5310	40.47	36.05
802.11ac-VHT40	MCS0	102	5510	41.01	36.07
802.11ac-VHT40	MCS0	110	5550	40.48	36.08
802.11ac-VHT40	MCS0	134	5670	39.93	36.05
802.11ac-VHT40	MCS0	142	5710	40.36	36.11
802.11ac-VHT80	MCS0	58	5290	81.56	75.36
802.11ac-VHT80	MCS0	106	5530	81.35	75.31
802.11ac-VHT80	MCS0	122	5610	81.58	75.35
802.11ac-VHT80	MCS0	138	5690	82.23	75.38
802.11ax-HE20	MCS0	52	5260	20.83	18.92
802.11ax-HE20	MCS0	60	5300	20.99	18.92
802.11ax-HE20	MCS0	64	5320	21.65	18.89
802.11ax-HE20	MCS0	100	5500	21.01	18.96
802.11ax-HE20	MCS0	116	5580	21.77	18.94
802.11ax-HE20	MCS0	140	5700	20.94	18.92
802.11ax-HE20	MCS0	144	5720	20.96	18.95
802.11ax-HE40	MCS0	54	5270	40.71	37.73
802.11ax-HE40	MCS0	62	5310	40.38	37.70
802.11ax-HE40	MCS0	102	5510	40.58	37.70
802.11ax-HE40	MCS0	110	5550	40.68	37.67
802.11ax-HE40	MCS0	134	5670	40.51	37.71
802.11ax-HE40	MCS0	142	5710	40.55	37.76
802.11ax-HE80	MCS0	58	5290	81.82	77.11
802.11ax-HE80	MCS0	106	5530	81.44	77.22
802.11ax-HE80	MCS0	122	5610	81.53	77.28
802.11ax-HE80	MCS0	138	5690	81.14	77.09

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

Channel 52 (5260MHz)



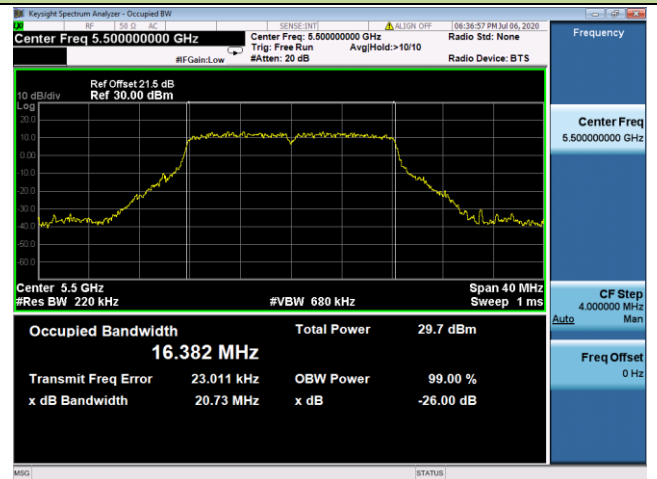
Channel 60 (5300MHz)



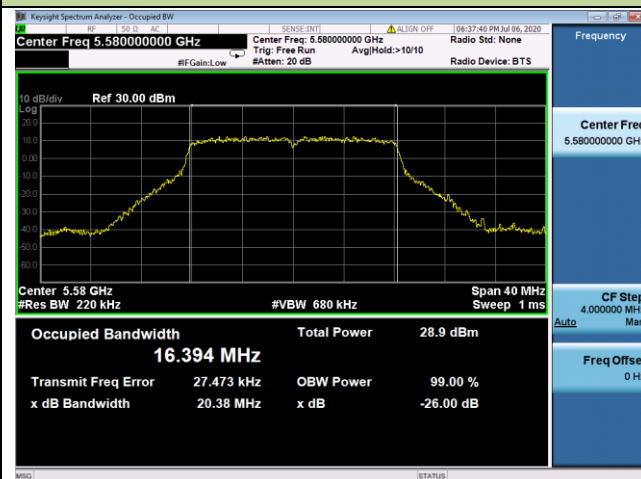
Channel 64 (5320MHz)



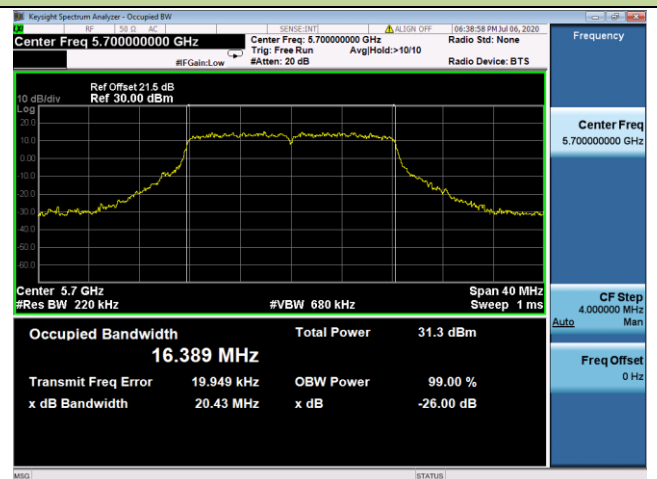
Channel 100 (5500MHz)



Channel 116 (5580MHz)

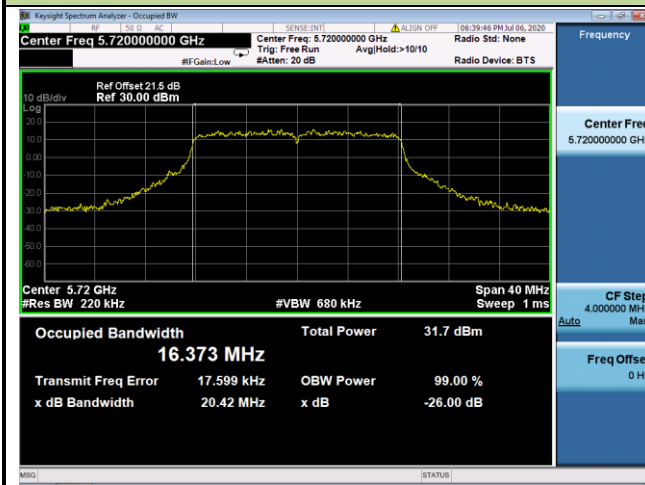


Channel 140 (5700MHz)



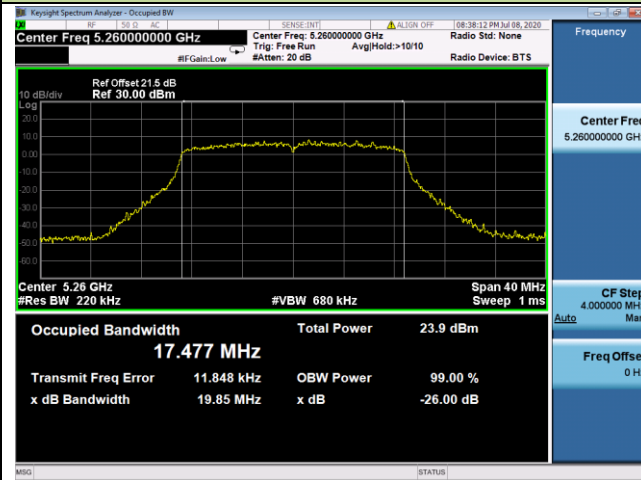
802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

Channel 144 (5720MHz)

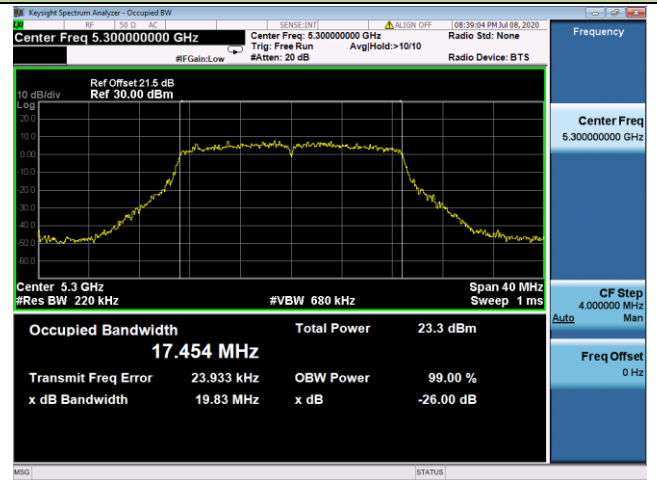


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

Channel 52 (5260MHz)



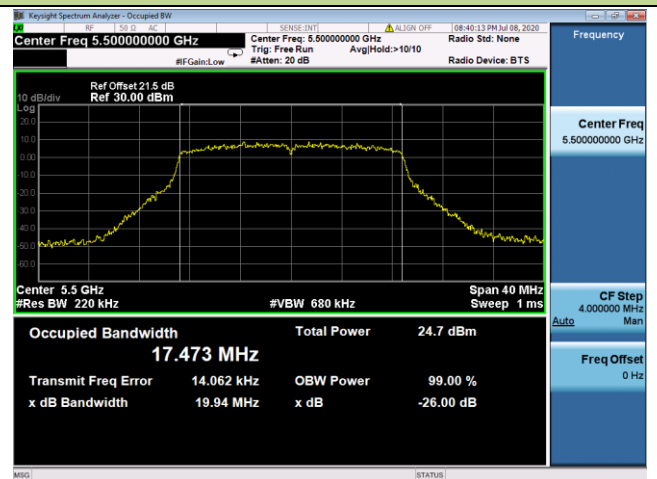
Channel 60 (5300MHz)



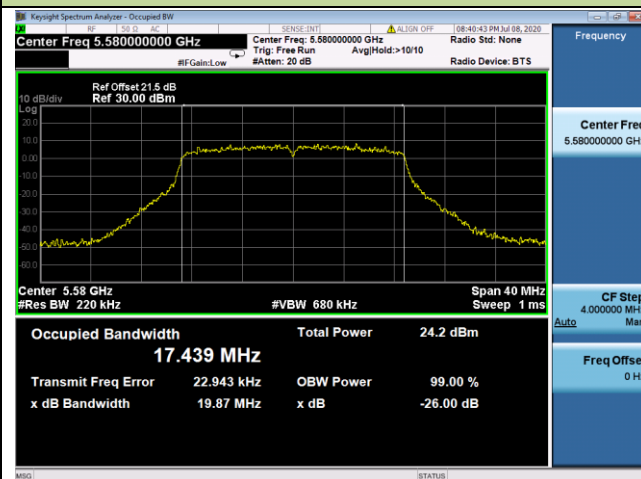
Channel 64 (5320MHz)



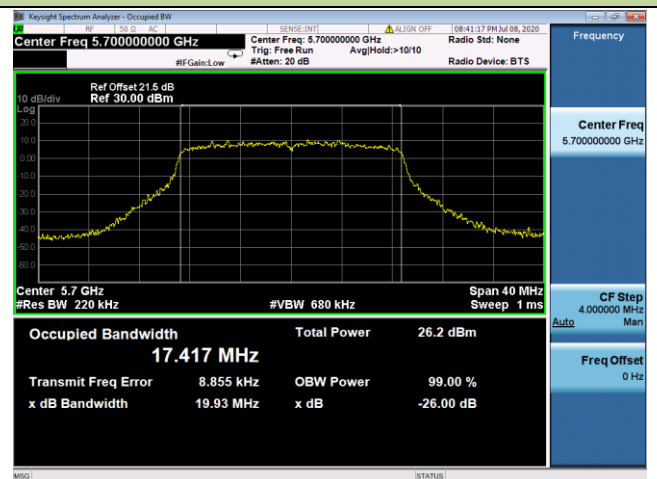
Channel 100 (5500MHz)



Channel 116 (5580MHz)

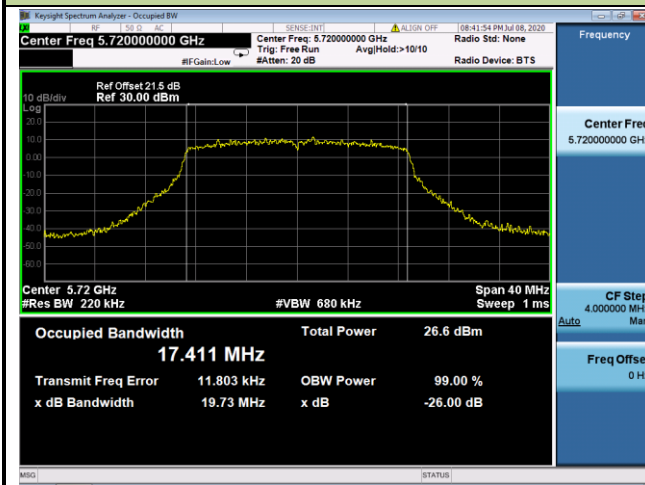


Channel 140 (5700MHz)



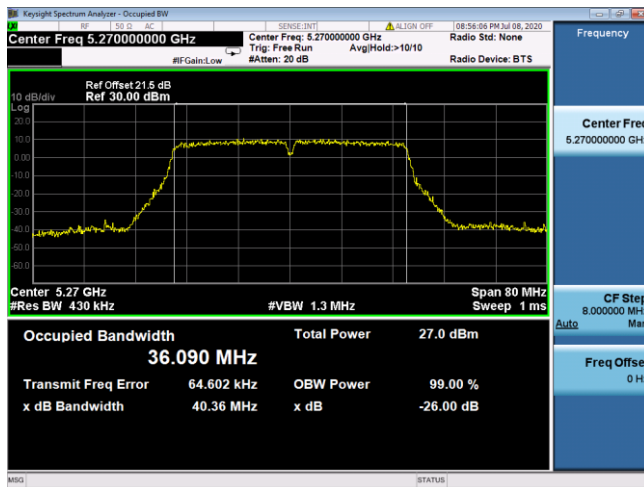
802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

Channel 144 (5720MHz)



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

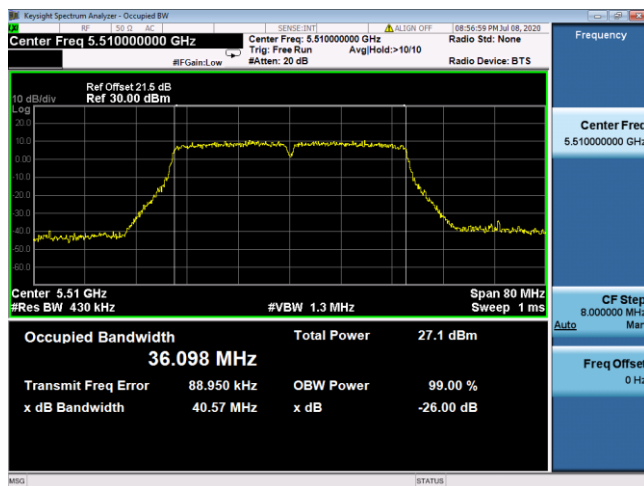
Channel 54 (5270MHz)



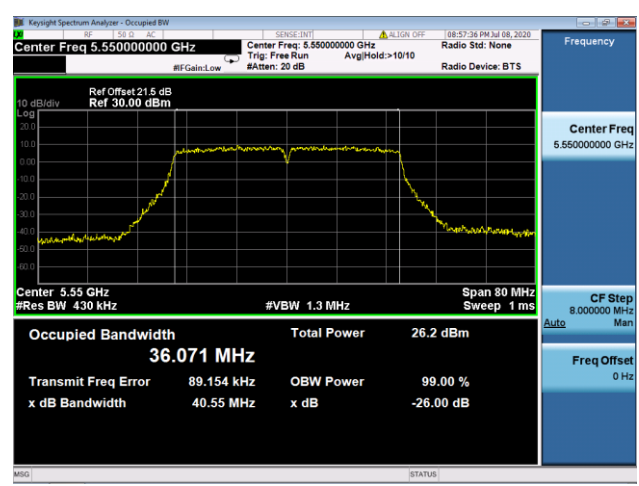
Channel 62 (5310MHz)



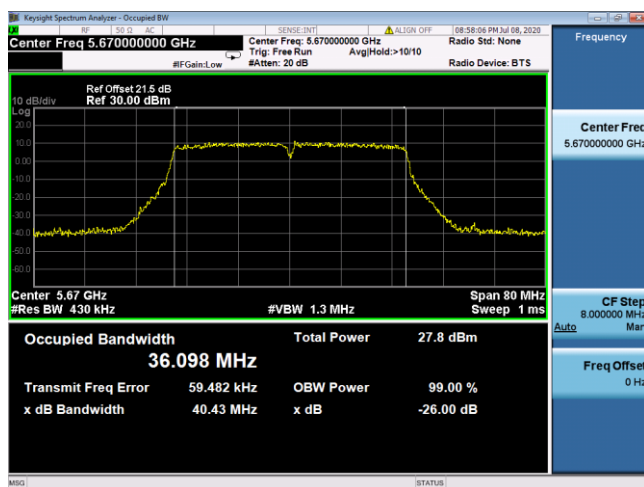
Channel 102 (5510MHz)



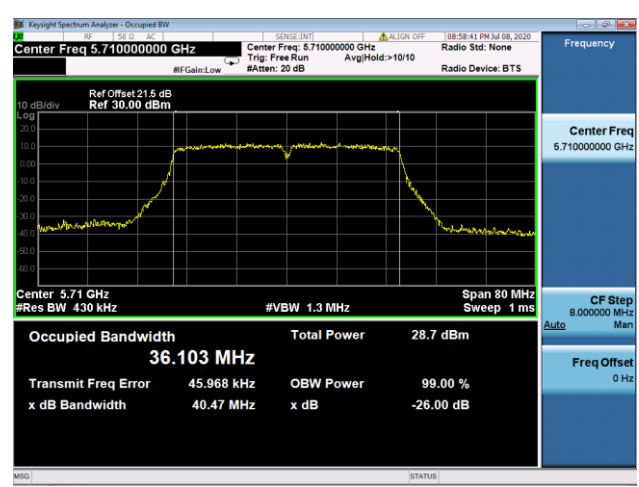
Channel 110 (5550MHz)



Channel 134 (5670MHz)

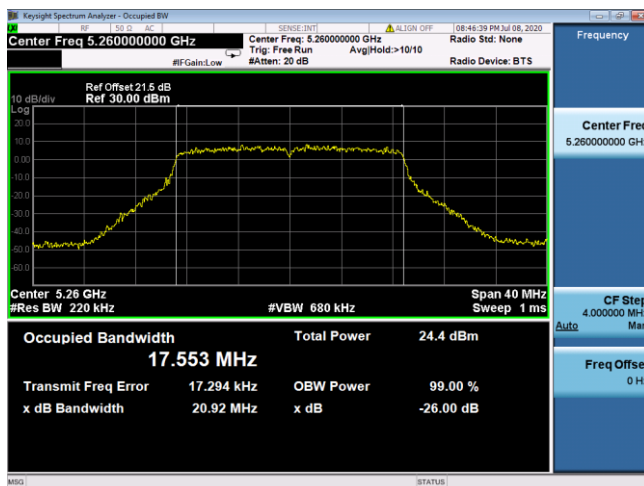


Channel 142 (5710MHz)

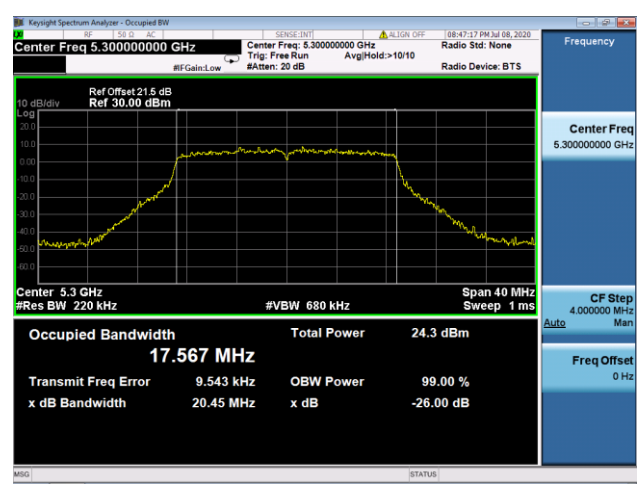


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

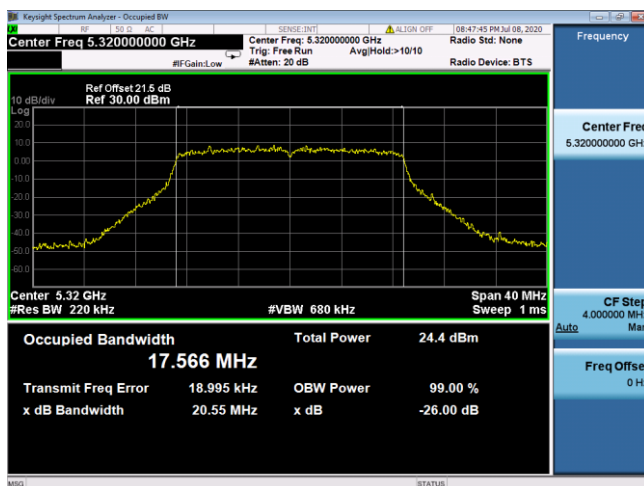
Channel 52 (5260MHz)



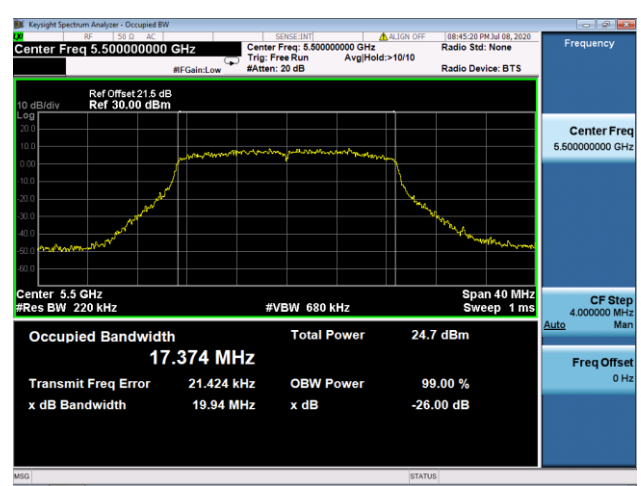
Channel 60 (5300MHz)



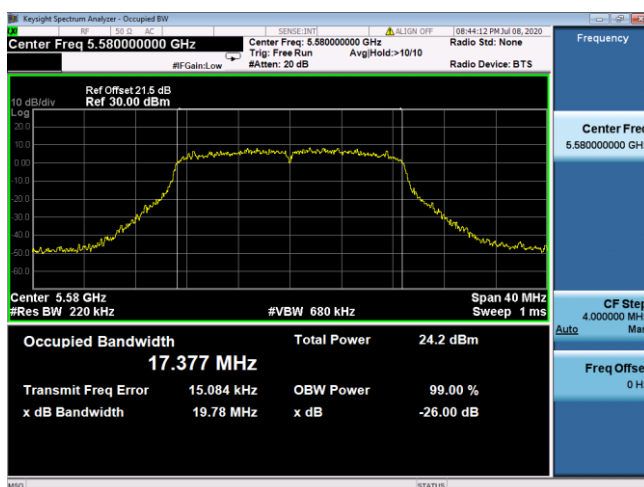
Channel 64 (5320MHz)



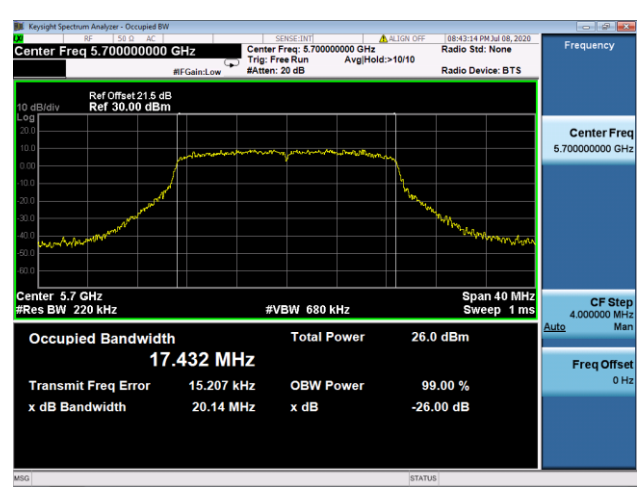
Channel 100 (5500MHz)



Channel 116 (5580MHz)

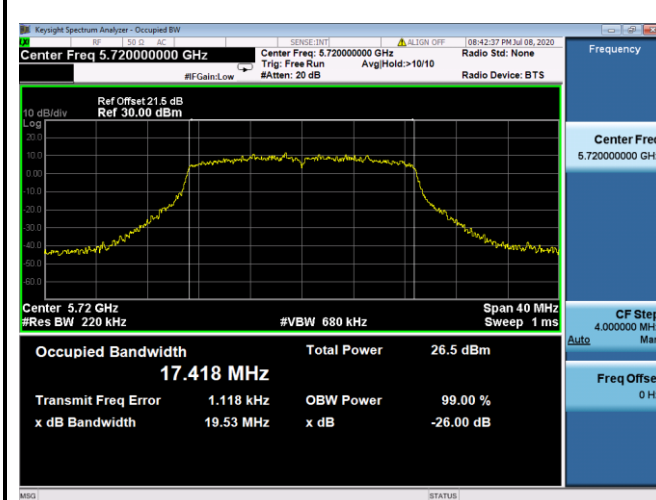


Channel 140 (5700MHz)



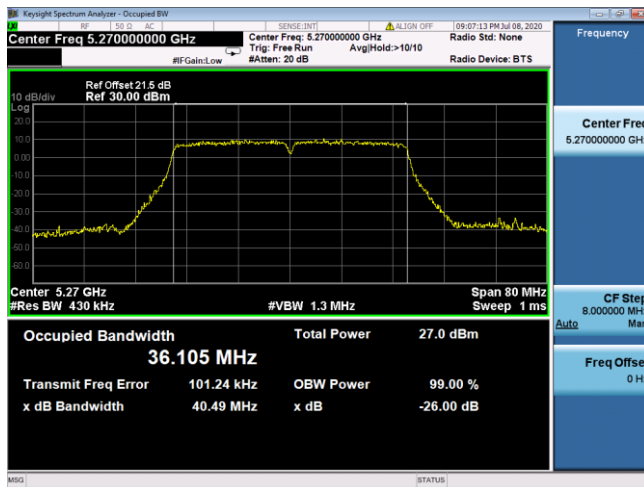
802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

Channel 144 (5720MHz)

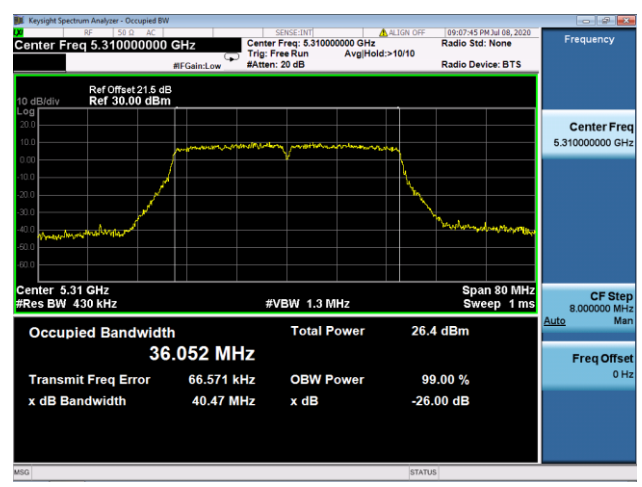


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

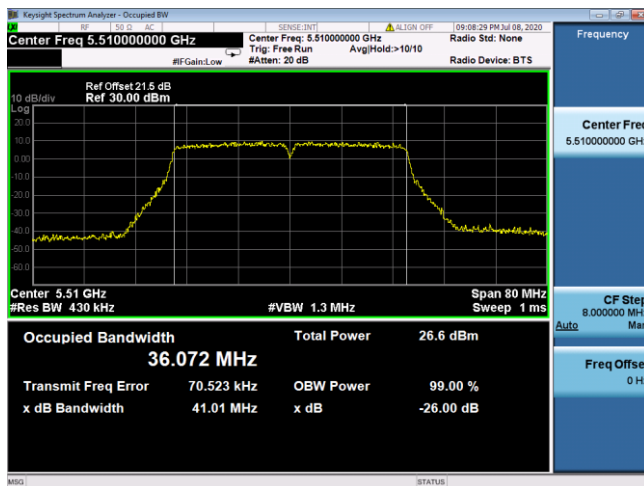
Channel 54 (5270MHz)



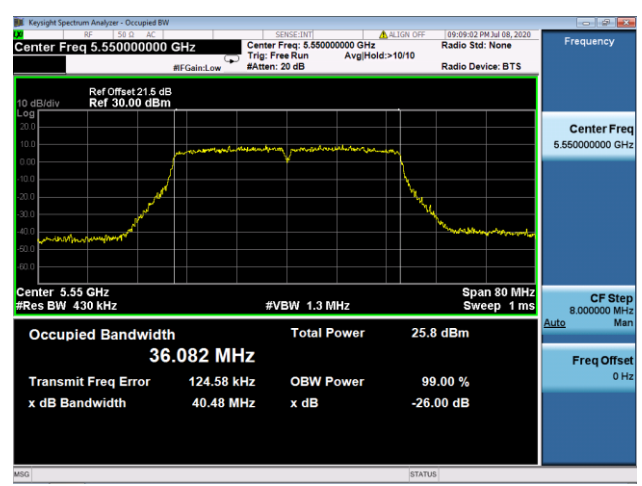
Channel 62 (5310MHz)



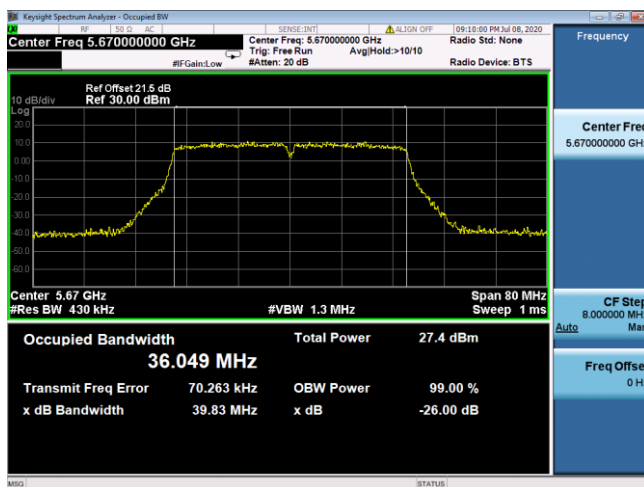
Channel 102 (5510MHz)



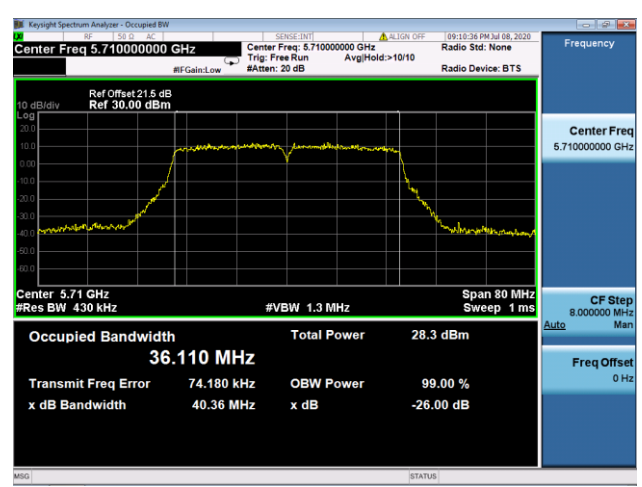
Channel 110 (5550MHz)



Channel 134 (5670MHz)

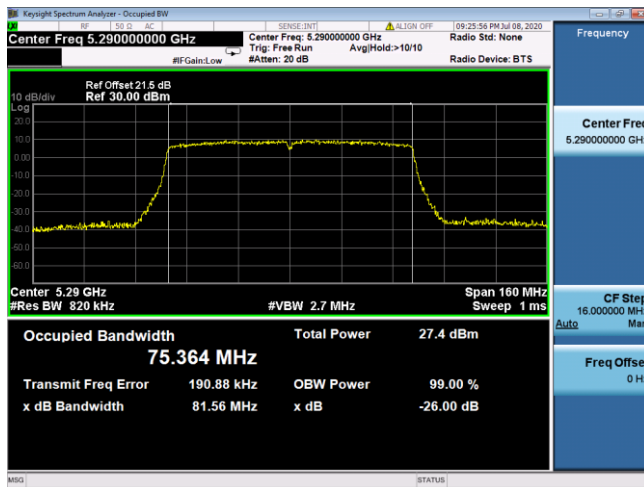


Channel 142 (5710MHz)

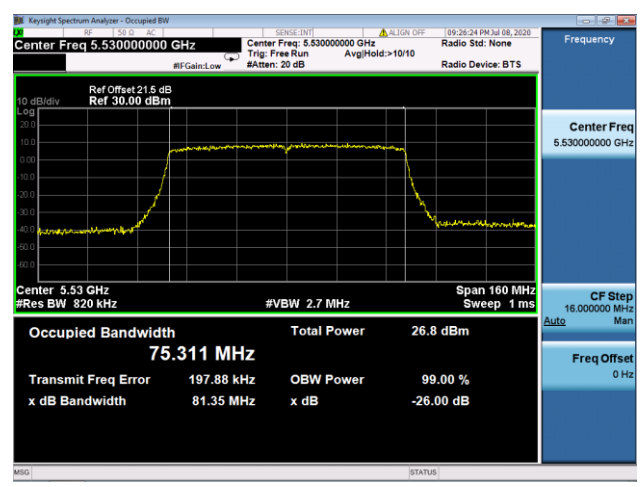


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

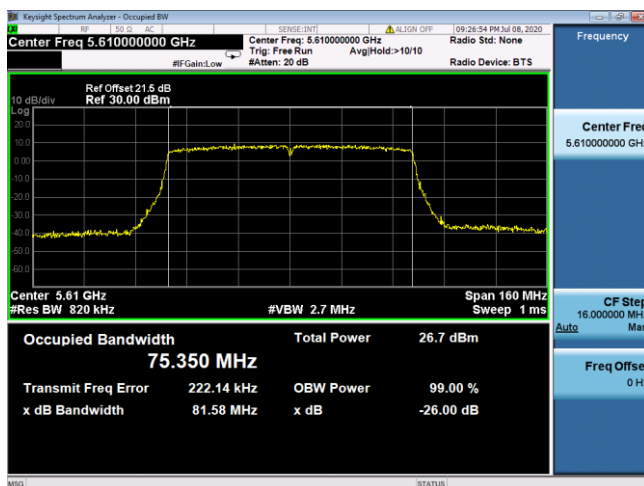
Channel 58 (5290MHz)



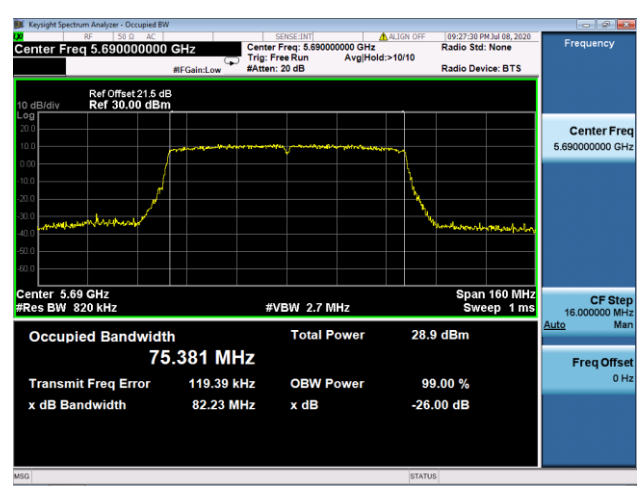
Channel 106 (5530MHz)



Channel 122 (5610MHz)

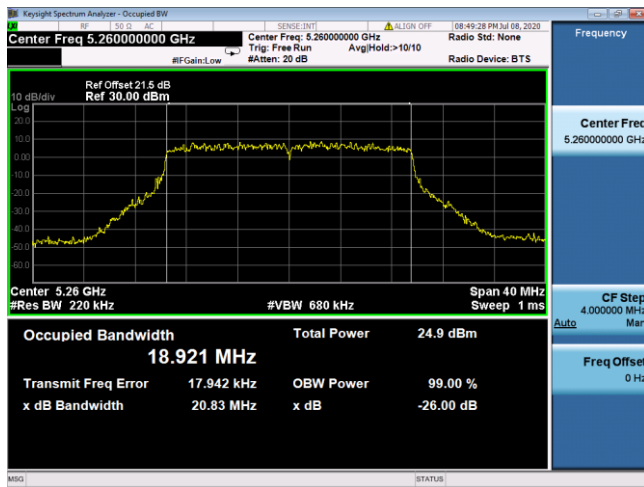


Channel 138 (5690MHz)

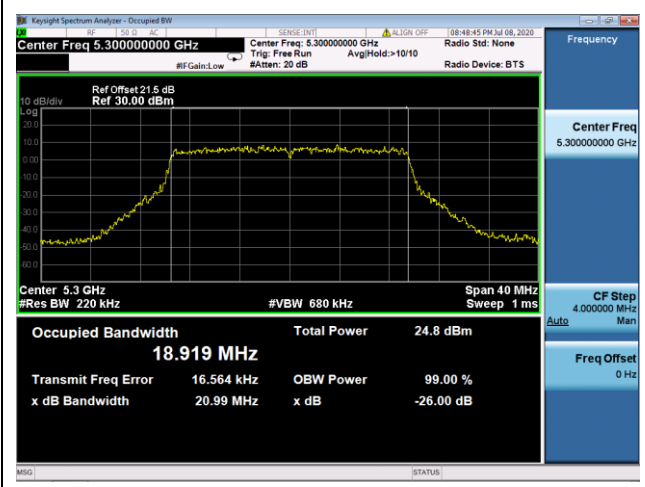


802.11ax-HE20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

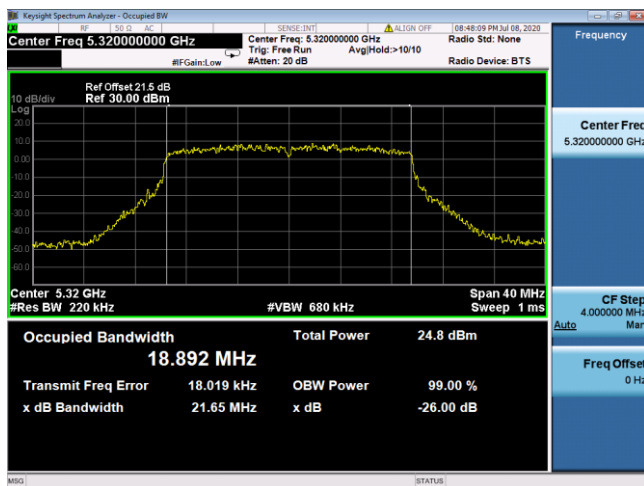
Channel 52 (5260MHz)



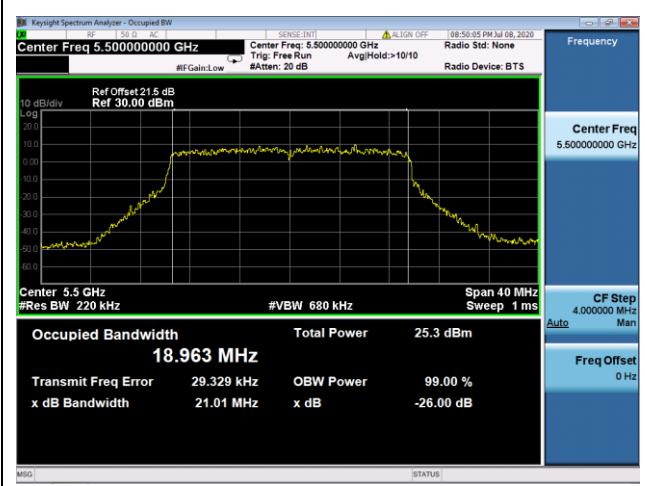
Channel 60 (5300MHz)



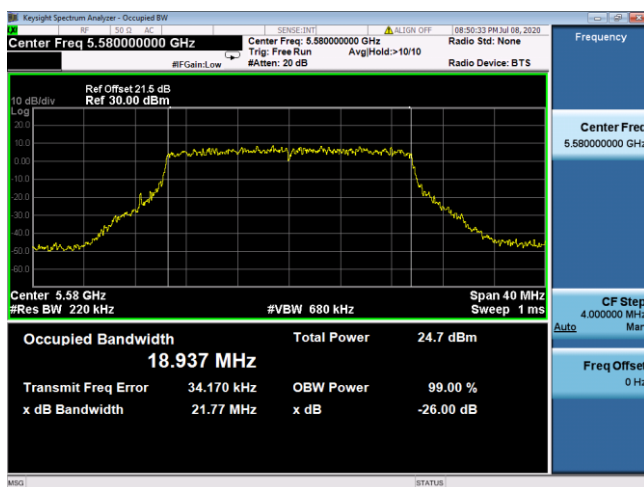
Channel 64 (5320MHz)



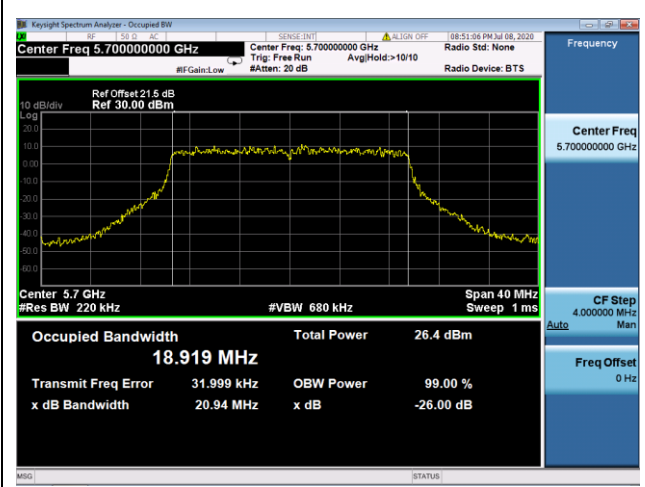
Channel 100 (5500MHz)



Channel 116 (5580MHz)



Channel 140 (5700MHz)



802.11ax-HE20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

Channel 144 (5720MHz)

