MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID:	Q9DAPIN0318
APPLICANT:	Hewlett Packard Enterprise Company
Application Type:	Class III Permissive Change
Product:	ACCESS POINT
Model No.:	APIN0318
Brand Name:	aruba a Hewlett Packard Enterprise company, Hewlett Packard Enterprise
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:	October 25, 2017 ~ March 11, 2018

Reviewed By : Paddy Chen
(Paddy Chen)

Approved By : Chenz Ker
(Chenz Ker)

Testing Laboratory
3261

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 measurementreport and was tested in accordance with the measurement procedures specified in KDB 789033 D02v02r01. Test results reported hereinrelate 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
1710TW0107-U8	Rev. 01	Initial Report	03-12-2018	Valid

CONTENTS

Description Page

§2.1033General Information 6

1. INTRODUCTION 7

1.1. Scope 7
1.2. MRT Test Location 7

2. PRODUCT INFORMATION 8

2.1. Equipment Description 8
2.2. Product Specification Subjective to this Report 8
2.3. Working Frequencies for this Report 9
2.4. Description of Available Antennas 10
2.5. Test Mode 12
2.6. Description of Test Software 13
2.7. Device Capabilities 19
2.8. Test Configuration 21
2.9. EMI Suppression Device(s)/Modifications 21
2.10. Labeling Requirements 21

3. DESCRIPTION OF TEST 22

3.1. Evaluation Procedure 22
3.2. AC Line Conducted Emissions 22
3.3. Radiated Emissions 23

4. ANTENNA REQUIREMENTS 24

5. TEST EQUIPMENT CALIBRATION DATE 25

6. MEASUREMENT UNCERTAINTY 26

7. TEST RESULT 27

7.1. Summary 27
7.2. 26dB Bandwidth Measurement 28
7.2.1. Test Limit 28
7.2.2. Test Procedure Used 28
7.2.3. Test Setting 28
7.2.4. Test Setup 28
7.2.5. Test Result 29
7.3. 6dB Bandwidth Measurement 44
7.3.1. Test Limit 44
7.3.2. Test Procedure used 44

7.3.3. TestSetting 44
7.3.4. Test Setup 44
7.3.5. Test Result 45
7.4. Output Power Measurement 49
7.4.1. Test Limit 49
7.4.2. Test Procedure Used 49
7.4.3. Test Setting 49
7.4.4. Test Setup 49
7.4.5. Test Result 50
7.5. Transmit Power Control 61
7.5.1. Test Limit 61
7.5.2. Test Procedure Used 61
7.5.3. Test Setting 61
7.5.4. Test Setup 61
7.5.5. Test Result 61
7.6. Power Spectral Density Measurement 62
7.6.1. Test Limit 62
7.6.2. Test Procedure Used 62
7.6.3. Test Setting 62
7.6.4. Test Setup 63
7.6.5. Test Result 64
7.7. Frequency Stability Measurement 230
7.7.1. Test Limit 230
7.7.2. Test Procedure Used 230
7.7.3. Test Setup 231
7.7.4. Test Result 232
7.8. Radiated Spurious Emission Measurement 233
7.8.1. Test Limit 233
7.8.2. Test Procedure Used 233
7.8.3. Test Setting 233
7.8.4. Test Setup 235
7.8.5. Test Result 238
7.9. Radiated Restricted Band Edge Measurement 434
7.9.1. Test Limit 434
7.9.2. Test Procedure Used 435
7.9.3. Test Setting 436
7.9.4. Test Setup 436
7.9.5. Test Result 438
7.10. AC Conducted Emissions Measurement 822

7.10.1. Test Limit 822
7.10.2. Test Procedure 822
7.10.3. Test Setup 823
7.10.4. Test Result..... 824

8. CONCLUSION..... 826

§2.1033General Information

Applicant:	Hewlett Packard Enterprise Company
Applicant Address:	3000 Hanover St. Palo Alto, CA 94304, USA
Manufacturer:	Hewlett Packard Enterprise Company
Manufacturer Address:	3000 Hanover St. Palo Alto, CA 94304, USA
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.:	153292
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
Test Device Serial No.:	Conducted Sample S/N: CNDNK7Y002 Radiated Sample S/N: CNDJK8001M

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) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.**
- **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.**

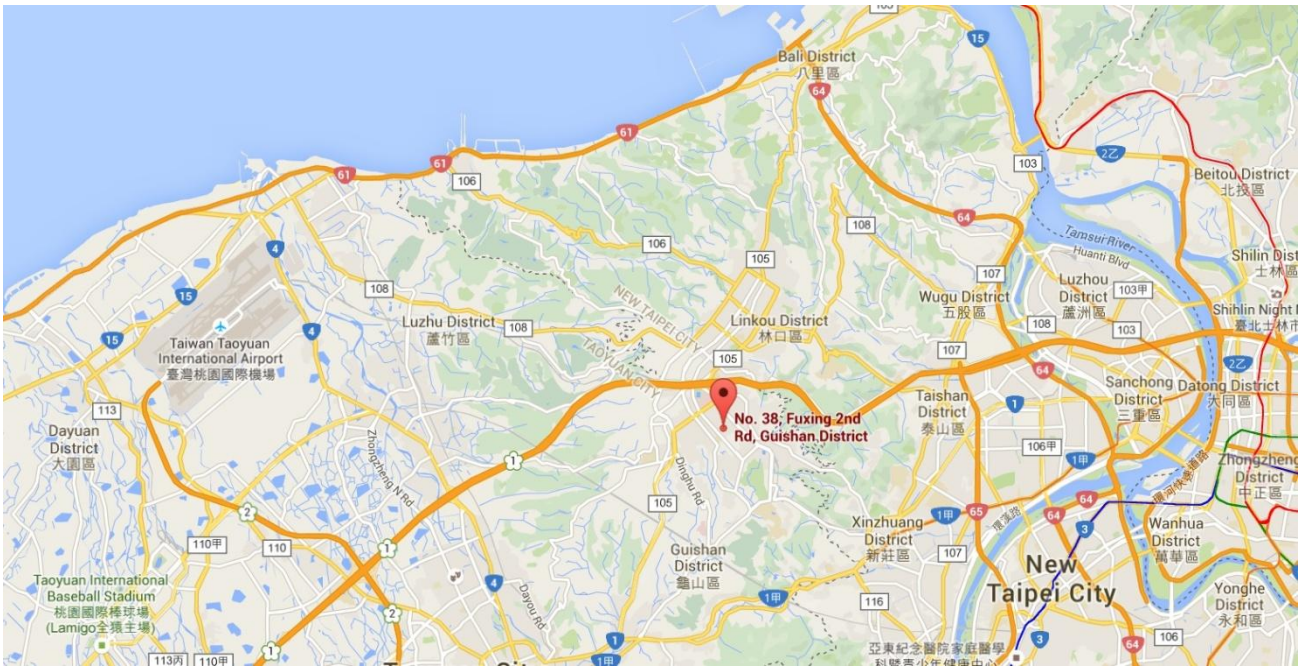
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices includingintentional and/or unintentional radiators for compliance with the technical rules and regulations of the FederalCommunications 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	ACCESS POINT
Model No.	APIN0318
Brand Name:	aruba a Hewlett Packard Enterprise company , Hewlett Packard Enterprise
Wi-Fi Specification:	802.11a/b/g/n/ac
Bluetooth Specification:	v4.0 single mode
Software Version:	R660.1.1.0.3.005
Operating Temperature:	-40 ~ 55 °C
Power Type:	POE input
Operating Environment:	Indoor Use

Note: The applicant provide one POE adapter (Manufacturer: MICROSEMI & Model: PD-9001GR/AT/AC) for approval testing, it is not for sale.

2.2. Product Specification Subjective to this Report

Frequency Range	For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5260~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5270~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80/ac-VHT80+80 (Non-contiguous): 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz For 802.11ac-VHT80+80 (Contiguous): 5210MHz + 5290MHz, 5530MHz + 5610MHz
Type of Modulation	802.11a/n/ac: OFDM
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.2Mbps

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

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

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/ac-VHT80+80 (Non-contiguous)

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	138	5690 MHz	155	5775 MHz

Note: For 802.11ac-VHT80+80 mode, Ant 0 & Ant 1 ports work on one frequency of the above table, Ant 2 & Ant 3 ports work on another frequency of the above table. E.g. channel 58 + 138 group, channel 58 will transmit by Ant 0+1 ports and channel 138 will transmit by Ant 2+3 ports.

802.11 ac-VHT80+80 (Contiguous)

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

Note: For example, Ant 0 & 1 ports operate on one 80MHz channel 42, while Ant 2 & 3 ports operate on the adjacent 80MHz channel 58.

2.4. Description of Available Antennas

Antenna No.	Polarization	Frequency Band (GHz)	Model No.	Max Peak Gain (dBi)	BF Gain (dBi)	CDD Directional Gain (dBi)	
						For Power	For PSD
Wi-Fi External Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)							
1	Omni	2.4	AP-ANT-40	4.0	3.01	4.0	7.01
		5		5.0	6.02	5.0	11.02
2	Omni	2.4	AP-ANT-19	3.0	3.01	3.0	6.01
		5		6.0	6.02	6.0	12.02
3	Omni	2.4	AP-ANT-1W	3.8	3.01	3.8	6.81
		5		5.8	6.02	5.8	11.82
4	Omni	2.4	AP-ANT-13B	2.3	3.01	2.3	5.31
		5		4.0	6.02	4.0	10.02
5	Omni	2.4	AP-ANT-20W	2.0	3.01	2.0	5.01
		5		2.0	6.02	2.0	8.02
6	Omni	2.4	AP-ANT-22 (Note 5)	2.0	3.01	2.0	5.01
		5		4.0	6.02	4.0	10.02
7 (Note 3)	Directional	2.4	AP-ANT-45	4.5	0.0	4.5	4.50
		5		5.5	3.01	5.5	8.51
8 (Note 3)	Directional	2.4	AP-ANT-48	8.5	0.0	8.5	8.5
		5		8.5	3.01	8.5	11.51
9 (Note 3)	Directional	2.4	ANT-2x2-2314	14.0	0.0	14.0	14.0
10 (Note 3)	Directional	5	ANT-4x4-5314	14.0	3.01	14.0	17.01
11 (Note 3)	Directional	5	ANT-3x3-5712	11.5	3.01	11.5	14.51
12 (Note 3)	Directional	2.4	AP-ANT-25A	5.0	0.0	5.0	5.0
		5		5.0	3.01	5.0	8.01
13 (Note 3)	Directional	2.4	AP-ANT-28	7.5	0.0	7.5	7.5
		5		7.5	3.01	7.5	10.51
14	Omni	2.4	AP-ANT-16	3.9	3.01	3.9	6.91
		5		4.7	6.02	4.7	10.72
Bluetooth Internal Antenna							
PCB		2.4		6.8			

Note:

1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
   For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.
   If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + 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 = 3.01;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac, not include 802.11a/b/g. Directional gain = G_{ANT} + BF Gain, BF Gain was declared by the applicant.
3. These antennas have Cross-Polarized design, the detail see the antenna specification.
4. Antennas 9# to 14# are newly added. We selected the Omni antenna 5# (minimum antenna gain) and Directional antenna 10# (maximum antenna gain) to perform 5GHz RF testing.
   For Omni antenna, the antenna 2# (maximum 5GHz antenna gain) had been assessed in the original FCC application.
5. The applicant changed the antenna 6# model from AP-ANT-32 to AP-ANT-22.
   AP-ANT-22 is identical to AP-ANT-32, the only difference is the number of antennas in the box.
   - AP-ANT-22: Having 2 antennas shipped in the package
   - AP-ANT-32: Having 3 antennas shipped in the package

2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11a (6Mbps)
	Mode 2: Transmit by 802.11n-HT20 (MCS0)
	Mode 3: Transmit by 802.11n-HT40 (MCS0)
	Mode 4: Transmit by 802.11ac-VHT20 (MCS0)
	Mode 5: Transmit by 802.11ac-VHT40 (MCS0)
	Mode 6: Transmit by 802.11ac-VHT80 (MCS0)
	Mode 7: Transmit by 802.11ac-VHT80+80 Non-contiguous (MCS0)
	Mode 8: Transmit by 802.11ac-VHT80+80 Contiguous (MCS0)

5GHz Test Mode	Ant 0 + 1 + 2 + 3	
	CDD	Beam-Forming
802.11a	√	×
802.11n-HT20	√	√
802.11n-HT40	√	√
802.11ac-VHT20	√	√
802.11ac-VHT40	√	√
802.11ac-VHT80	√	√
802.11ac-VHT80+80 (Non-Contiguous)	√	√
802.11ac-VHT80+80 (Contiguous)	√	×

Note: 802.11n and 802.11ac have same modulation type and using the same power parameter, after the assessment, we only showed 802.11ac worst-case test data in the report.

2.6. Description of Test Software

The test utility software used during testing was“QCARCT”, and the version was “v3.0.174.0”.

Power Parameter Value for Omni Antenna (AP-ANT-20W):

Test Mode	Test Channel No.	Test Frequency (MHz)	Power Parameter Value	
			CDD Mode	Beam-Forming Mode
802.11a	36	5180	19.0	--
	44	5220	19.5	--
	48	5240	19.5	--
	52	5260	13.5	--
	60	5300	14.0	--
	64	5320	14.0	--
	100	5500	13.0	--
	120	5600	13.0	--
	140	5700	13.0	--
	144	5720	13.5	--
	149	5745	22.0	--
	157	5785	22.0	--
	165	5825	22.0	--
802.11ac-VHT20	36	5180	20.0	20.0
	44	5220	20.0	20.0
	48	5240	20.0	20.0
	52	5260	14.0	14.0
	60	5300	14.5	14.5
	64	5320	14.5	14.5
	100	5500	13.5	13.5
	120	5600	13.5	13.5
	140	5700	13.5	13.5
	144	5720	13.5	13.5
	149	5745	22.0	21.5
	157	5785	22.0	21.5
	165	5825	22.0	21.5

802.11ac-VHT40	38	5190	14.0	21.0
	46	5230	21.0	21.0
	54	5270	16.0	15.0
	62	5310	16.0	15.0
	102	5510	16.0	15.0
	118	5590	15.5	15.0
	134	5670	15.5	15.0
	142	5710	16.0	15.0
	151	5755	21.5	21.5
	159	5795	21.5	21.5
802.11ac-VHT80	42	5210	11.0	18.0
	58	5290	15.0	15.0
	106	5530	13.5	15.0
	122	5610	17.0	15.0
	138	5690	17.0	15.0
	155	5775	19.5	21.0
802.11ac-VHT80+80 (Contiguous)	42	5210	14.5	--
	58	5290		
	106	5530	17.0	--
	122	5610		

Test Mode	Test Ch. No.	Test Freq. (MHz)	Power Parameter Value			
			CDD Mode		Beam-Forming Mode	
			Ant 0 + 1 / Ant 0 + 1 + 2 + 3	Ant 2 + 3 / Ant 0 + 1 + 2 + 3	Ant 0 + 1 / Ant 0 + 1 + 2 + 3	Ant 2 + 3 / Ant 0 + 1 + 2 + 3
Non-contiguous 80+80 MHz mode fall within different UNII band						
802.11ac-VHT80+80	42	5210	14.0	--	20.0	--
	42	5210	--	14.5	--	21.5
	58	5290	18.0	--	18.0	--
	58	5290	--	18.0	--	18.0
	106	5530	15.5	--	18.0	--
	106	5530	--	15.5	--	18.0
	122	5610	20.0	--	18.0	--
	122	5610	--	20.0	--	18.0
	138	5690	20.0	--	18.0	--
	138	5690	--	20.0	--	18.0
	155	5775	21.0	--	21.5	--
	155	5775	--	21.0	--	21.5
Non-contiguous 80+80 MHz mode fall within same UNII band						
802.11ac-VHT80+80	106	5530	16.0	--	15.0	--
	138	5690	--	16.0	--	15.0
	106	5530	--	17.0	--	15.0
	138	5690	17.0	--	15.0	--

Note: For BF mode, the radiated emission and band edge using the radiated setup method shown on page 73, the conducted test item using the “QCARCT” software, both of them using the same power setting value. Based on these conditions as above, we found that the test result using the “QCARCT” software was worse than using radiated setup method within 0.3dB after verification.

Power Parameter Value for Directional Antenna (ANT-4x4-5314):

Test Mode	Test Channel No.	Test Frequency (MHz)	Power Parameter Value	
			CDD Mode	Beam-Forming Mode
802.11a	36	5180	10.5	--
	44	5220	10.5	--
	48	5240	10.5	--
	52	5260	4.0	--
	60	5300	4.0	--
	64	5320	4.5	--
	100	5500	4.0	--
	120	5600	4.0	--
	140	5700	4.5	--
	144	5720	5.0	--
	149	5745	15.5	--
	157	5785	15.5	--
	165	5825	14.5	--
802.11ac-VHT20	36	5180	11.0	11.0
	44	5220	10.5	10.5
	48	5240	10.5	10.5
	52	5260	4.5	4.5
	60	5300	4.5	4.5
	64	5320	5.0	5.0
	100	5500	4.5	4.5
	120	5600	4.5	4.5
	140	5700	5.0	5.0
	144	5720	5.0	5.0
	149	5745	16.0	12.5
	157	5785	16.0	12.5
	165	5825	14.5	12.5

802.11ac-VHT40	38	5190	11.0	11.0
	46	5230	12.5	12.5
	54	5270	6.5	6.5
	62	5310	6.5	6.5
	102	5510	6.5	6.5
	118	5590	6.5	6.5
	134	5670	7.0	7.0
	142	5710	7.0	7.0
	151	5755	15.5	12.5
	159	5795	15.5	12.0
802.11ac-VHT80	42	5210	8.0	11.5
	58	5290	9.0	5.5
	106	5530	9.0	6.0
	122	5610	9.0	6.0
	138	5690	9.0	6.0
	155	5775	14.5	12.0
802.11ac-VHT80+80 (Contiguous)	42	5210	10.0	--
	58	5290		
	106	5530	9.0	--
	122	5610		

Test Mode	Test Channel No.	Test Frequency (MHz)	Power Parameter Value for CDD & Beam-Forming Mode	
			Ant 0 + 1 / Ant 0 + 1 + 2 + 3	Ant 2 + 3 / Ant 0 + 1 + 2 + 3
Non-contiguous 80+80 MHz mode fall within different UNII band				
802.11ac-VHT80+80	42	5210	12.0	--
	42	5210	--	12.5
	58	5290	12.0	--
	58	5290	--	12.0
	106	5530	12.0	--
	106	5530	--	12.0
	122	5610	12.0	--
	122	5610	--	12.0
	138	5690	12.0	--
	138	5690	--	12.0
	155	5775	17.0	--
	155	5775	--	18.5
Non-contiguous 80+80 MHz mode fall within same UNII band				
802.11ac-VHT80+80	106	5530	9.0	--
	138	5690	--	9.0
	106	5530	--	9.0
	138	5690	9.0	--

Note: For BF mode, the radiated emission and band edge using the radiated setup method shown on page 73, the conducted test item using the “QCARCT” software, both of them using the same power setting value. Based on these conditions as above, we found that the test result using the “QCARCT” software was worse than using radiated setup method within 0.3dB after verification.

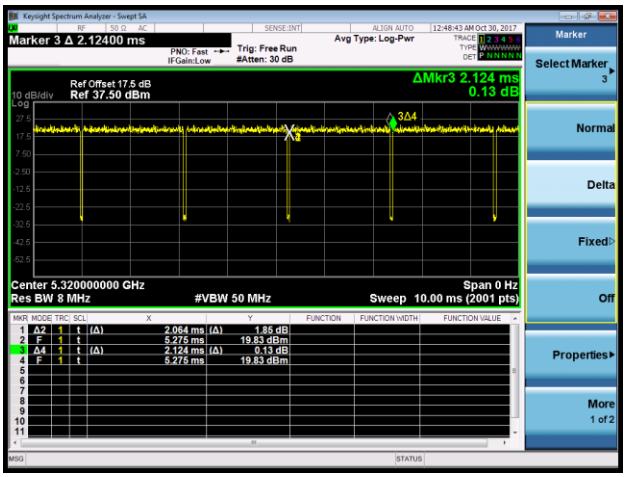
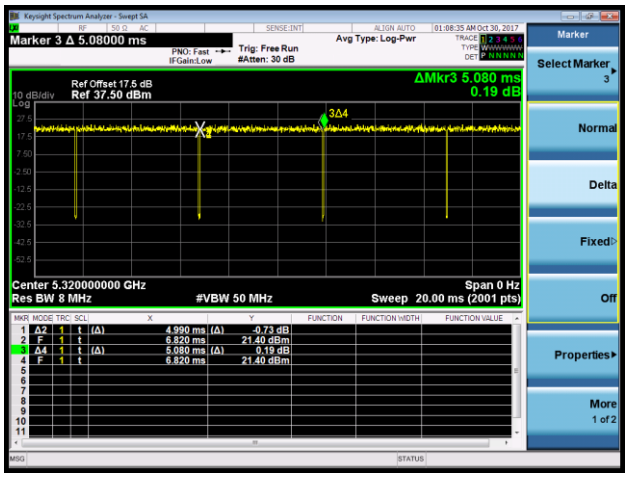
2.7. Device Capabilities

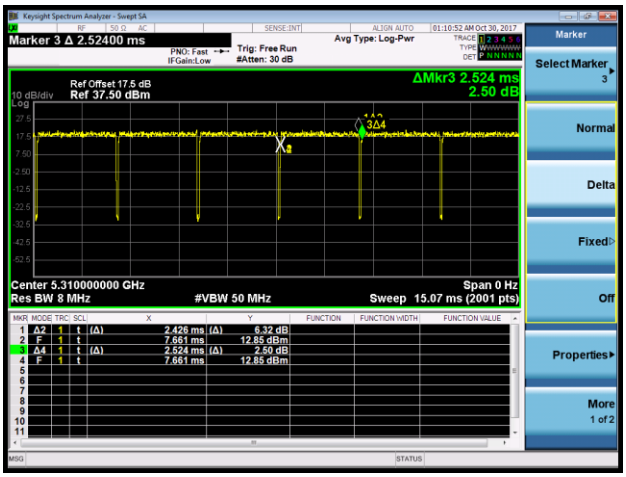
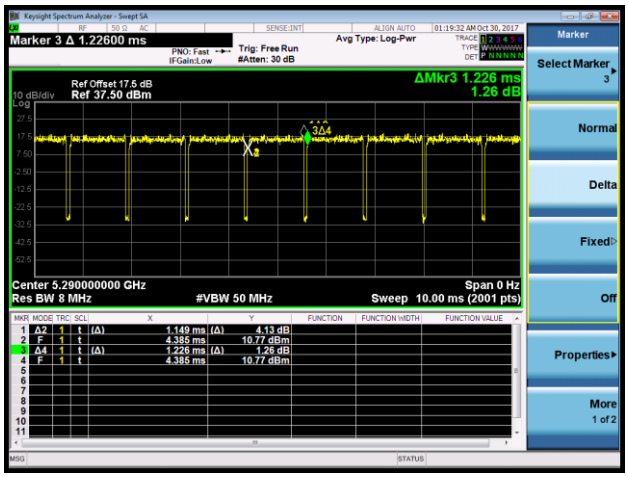
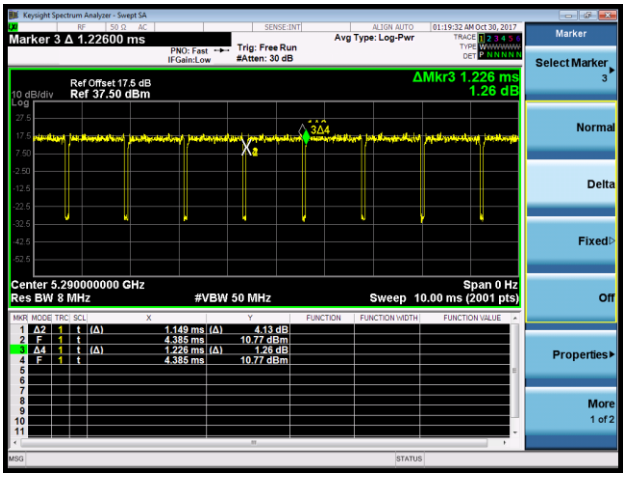
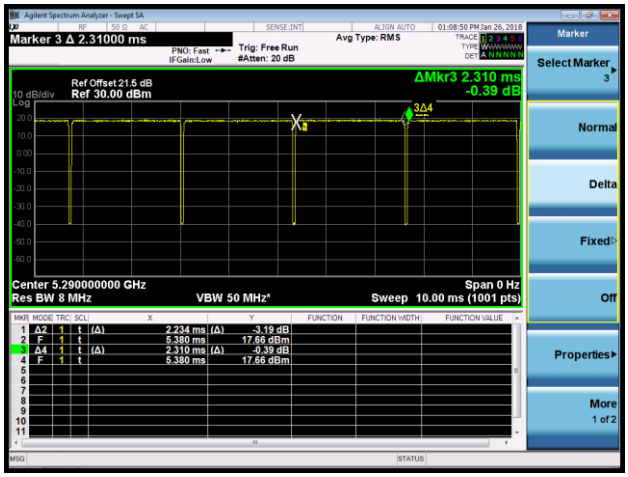
This device contains the following capabilities:

802.11a/b/g/n/ac Wi-Fi & Bluetooth v4.0 single mode.

Note: 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, and detector = peak or average 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	97.18 %
802.11ac-VHT20	98.23 %
802.11ac-VHT40	96.12 %
802.11ac-VHT80	93.75 %
802.11ac-VHT80+80 (Non-contiguous)	93.75 %
802.11ac-VHT80+80 (Contiguous)	96.71 %

802.11a (T = 2.064ms)	802.11ac-VHT20 (T = 4.990ms)
	

802.11ac-VHT40 (T = 2.426ms)	802.11ac-VHT80 (T = 1.149ms)
	
802.11ac-VHT80+80 (T = 1.149ms) (Non-contiguous)	802.11ac-VHT80+80 (T = 2.234ms) (Contiguous)
	

2.8. Test Configuration

The **ACCESS POINT**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 testingand AC line conducted testing.

2.9. EMI Suppression Device(s)/Modifications

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

2.10. 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 pamphletsupplied to the user and be readily visible to the purchaser at the time of purchase. However, when the deviceis 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 andlabel location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed WirelessDevices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v02r01 were used in themeasurement of the **ACCESS POINT.**

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an8'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. An80cm 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 tomaximize 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 theresponsible party can be used with the device. The use of a permanently attached antenna or of an antennathat uses a unique coupling to the intentional radiator shall be considered sufficient to comply with theprovisions of this section."

Conclusion:

The product is defined as the professional installation of equipment by the manufacturer, there is no necessary to comply with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2018/03/17
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2018/03/23
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2018/03/23
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2018/06/08

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2018/03/02
				1 year	2019/03/02
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2018/03/16
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2018/04/06
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2018/04/06
Acitve Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2018/04/06
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2018/04/06
Broadband Hornantenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2018/04/06
Breitband Hornantenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2018/04/06
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2018/06/08

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2018/07/10
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00014	1 year	2018/03/18
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00015	1 year	2018/03/18
Programmable Temperature & Humidity Chamber	TEN BILLION	TTH-B3UP	MRTTWA00036	1 year	2018/05/11
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2018/06/08

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: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 40GHz: 4.76dB
Output Power - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Product Name: **ACCESS POINT**

FCC ID: **Q9DAPIN0318**

FCC Classification: **Unlicensed National Information Infrastructure (UNII)**

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section7.2
15.407(a)(2)	Maximum Conducted Output Power	Refer to Section 7.3		Pass	Section 7.3
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 7.4
15.407(a)(2), (5)	Peak Power Spectral Density	Refer to Section 7.5		Pass	Section 7.5
15.407(g)	Frequency Stability	± 20 ppm		Pass	Section 7.6
15.407(b)(2), (3), (5)	Undesirable Emissions	≤ -27dBm/MHz EIRP	Radiated	Pass	Section 7.7 & 7.8
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 7.9

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 ofthe system to connect the EUT to the analyzer at all frequencies of interest.

2) Test Items “26dB Bandwidth”, “99% 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

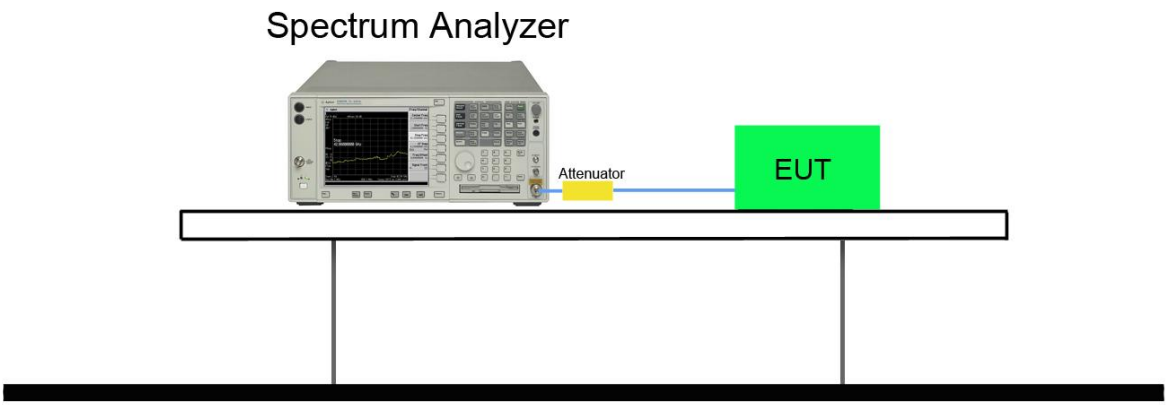
7.2.2.Test Procedure Used

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 ≥ 3×RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4.Test Setup



7.2.5.Test Result

Product	ACCESS POINT	Temperature	24°C
Test Engineer	Kevin Ker	Relative Humidity	59%
Test Site	SR2	Test Date	2018/02/09
Antenna Type	Omin Antenna (AP-ANT-20W)		

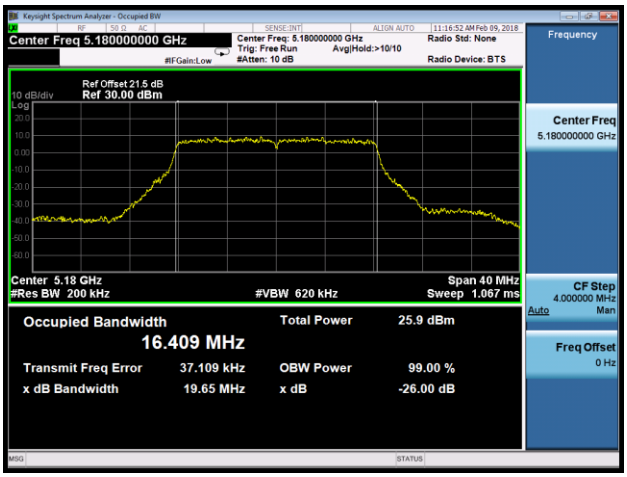
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1 + 2 + 3					
802.11a	6Mbps	36	5180	19.65	16.41
802.11a	6Mbps	44	5220	19.54	16.40
802.11a	6Mbps	48	5240	19.34	16.41
802.11a	6Mbps	52	5260	19.59	16.40
802.11a	6Mbps	60	5300	19.63	16.40
802.11a	6Mbps	64	5320	19.58	16.40
802.11a	6Mbps	100	5500	19.47	16.41
802.11a	6Mbps	120	5600	19.48	16.40
802.11a	6Mbps	140	5700	19.75	16.41
802.11a	6Mbps	144	5720	19.70	16.41
802.11a	6Mbps	149	5745	19.81	16.42
802.11a	6Mbps	157	5785	20.28	16.44
802.11a	6Mbps	165	5825	20.00	16.44
802.11ac-VHT20	MCS0	36	5180	20.21	17.58
802.11ac-VHT20	MCS0	44	5220	20.12	17.59
802.11ac-VHT20	MCS0	48	5240	20.25	17.59
802.11ac-VHT20	MCS0	52	5260	20.26	17.58
802.11ac-VHT20	MCS0	60	5300	20.22	17.59
802.11ac-VHT20	MCS0	64	5320	20.05	17.58
802.11ac-VHT20	MCS0	100	5500	20.44	17.60
802.11ac-VHT20	MCS0	120	5600	20.11	17.60
802.11ac-VHT20	MCS0	140	5700	20.25	17.60
802.11ac-VHT20	MCS0	144	5720	20.34	17.60
802.11ac-VHT20	MCS0	149	5745	20.68	17.61
802.11ac-VHT20	MCS0	157	5785	20.53	17.62
802.11ac-VHT20	MCS0	165	5825	20.76	17.61

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac-VHT40	MCS0	38	5190	39.13	35.81
802.11ac-VHT40	MCS0	46	5230	39.42	35.86
802.11ac-VHT40	MCS0	54	5270	39.48	35.85
802.11ac-VHT40	MCS0	62	5310	39.82	35.82
802.11ac-VHT40	MCS0	102	5510	39.19	35.83
802.11ac-VHT40	MCS0	118	5590	39.75	35.85
802.11ac-VHT40	MCS0	134	5670	39.68	35.87
802.11ac-VHT40	MCS0	142	5710	39.59	35.85
802.11ac-VHT40	MCS0	151	5755	39.82	35.92
802.11ac-VHT40	MCS0	159	5795	39.93	35.93
802.11ac-VHT80	MCS0	42	5210	82.55	75.81
802.11ac-VHT80	MCS0	58	5290	82.06	75.81
802.11ac-VHT80	MCS0	106	5530	82.06	75.73
802.11ac-VHT80	MCS0	122	5610	82.99	75.70
802.11ac-VHT80	MCS0	138	5690	83.28	75.79
802.11ac-VHT80	MCS0	155	5775	82.37	75.79
Non-contiguous 80+80 MHz mode_Ant 0 / Ant 0 + 1 (Ant 0 + 1 + 2 + 3)					
802.11ac-VHT80+80	MCS0	42	5210	83.31	75.79
802.11ac-VHT80+80	MCS0	58	5290	83.49	75.72
802.11ac-VHT80+80	MCS0	106	5530	83.18	75.64
802.11ac-VHT80+80	MCS0	122	5610	83.78	75.76
802.11ac-VHT80+80	MCS0	138	5690	82.78	75.80
802.11ac-VHT80+80	MCS0	155	5775	84.19	75.79
Non-contiguous 80+80 MHz mode_Ant 3 / Ant 2 + 3 (Ant 0 + 1 + 2 + 3)					
802.11ac-VHT80+80	MCS0	42	5210	83.30	75.73
802.11ac-VHT80+80	MCS0	58	5290	83.39	75.77
802.11ac-VHT80+80	MCS0	106	5530	82.35	75.75
802.11ac-VHT80+80	MCS0	122	5610	82.00	75.50
802.11ac-VHT80+80	MCS0	138	5690	82.64	75.60
802.11ac-VHT80+80	MCS0	155	5775	83.80	75.75

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Contiguous 80+80 MHz mode_Ant 0 + 1 + 2 + 3					
802.11ac-VHT80+80 Contiguous	MCS0	42	5210	162.66	155.64
		58	5290		
802.11ac-VHT80+80 Contiguous	MCS0	106	5530	162.92	155.72
		122	5610		
Note: The detail calculation see page 43.					

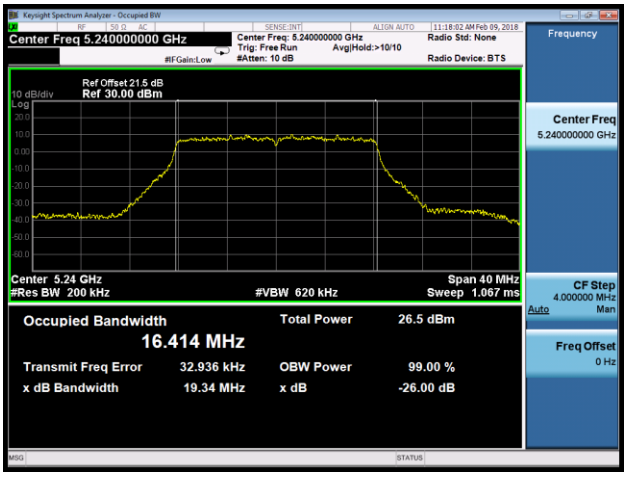
802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

Channel 36 (5180MHz)

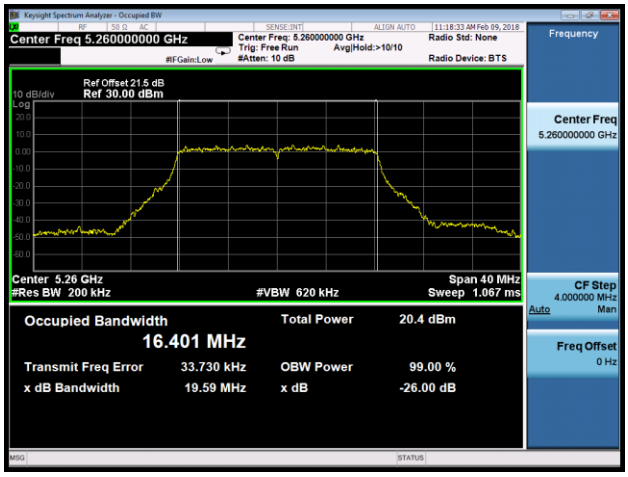


Channel 44 (5220MHz)

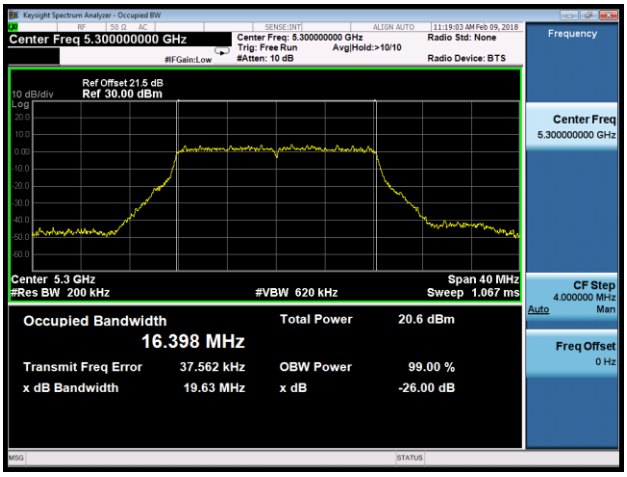
Channel 48 (5240MHz)



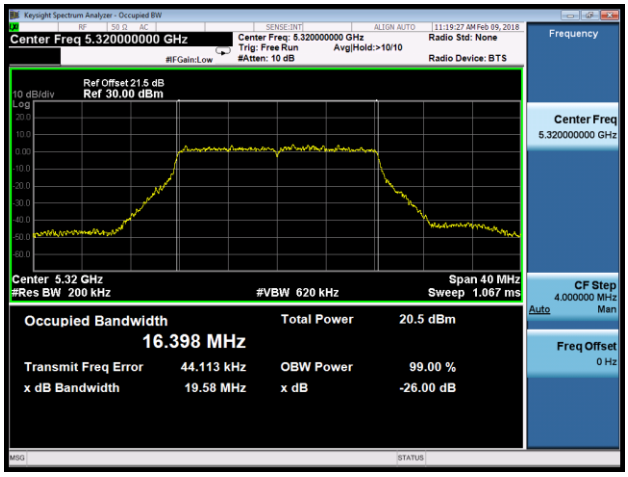
Channel 52 (5260MHz)



Channel 60 (5300MHz)

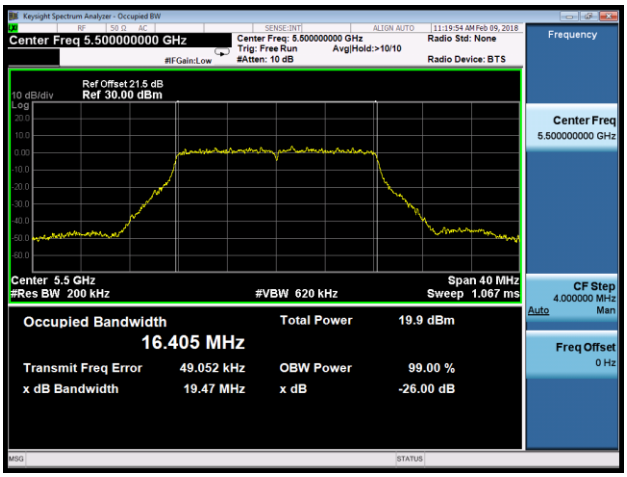


Channel 64 (5320MHz)

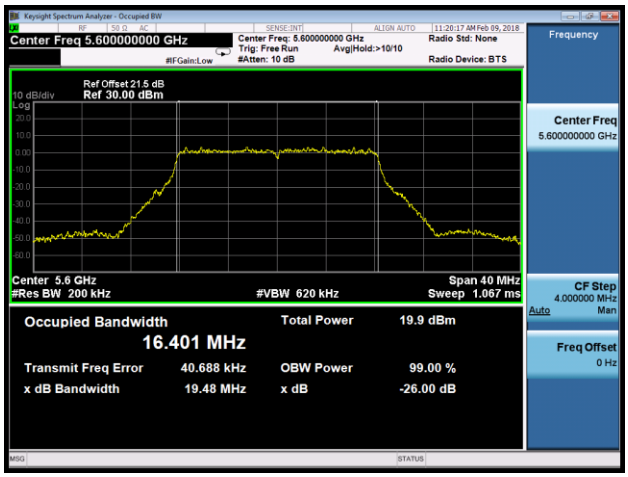


802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

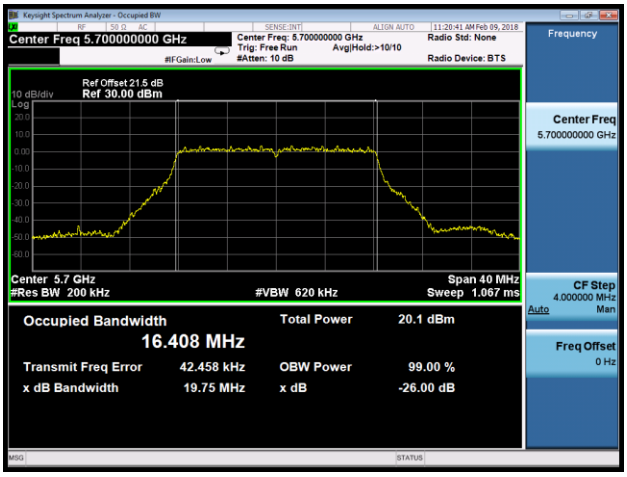
Channel 100 (5500MHz)



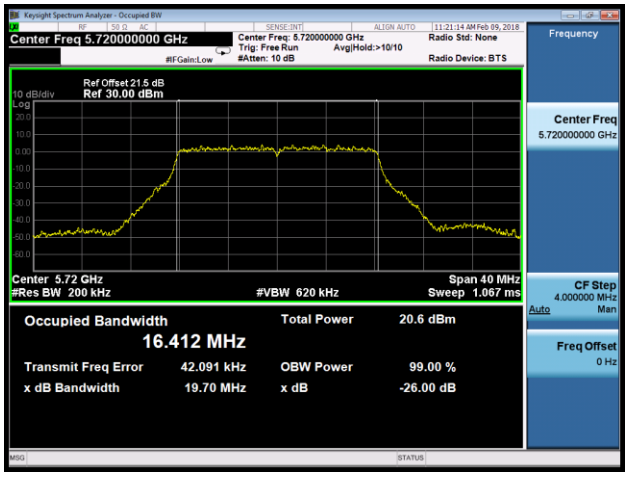
Channel 100 (5600MHz)



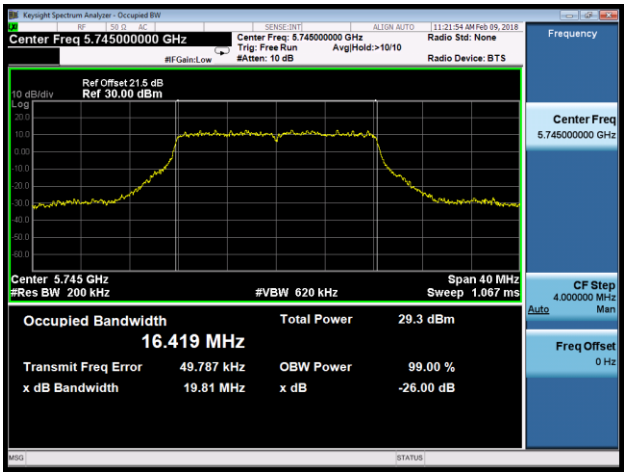
Channel 140 (5700MHz)



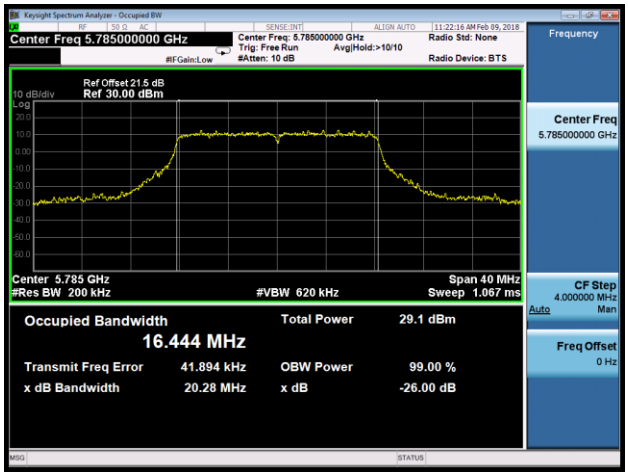
Channel 144 (5720MHz)

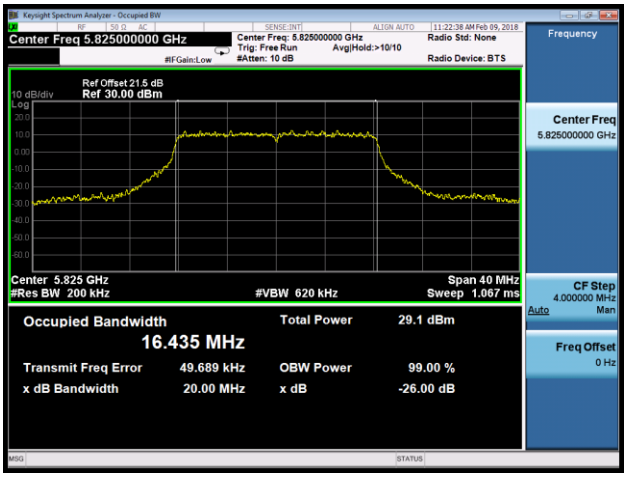


Channel 149 (5745MHz)



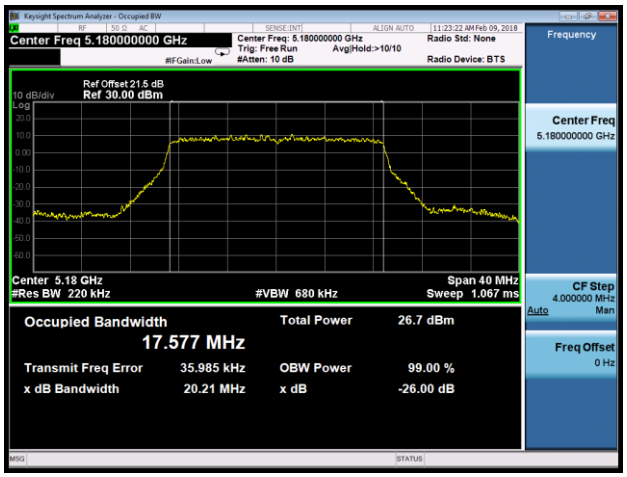
Channel 157 (5785MHz)



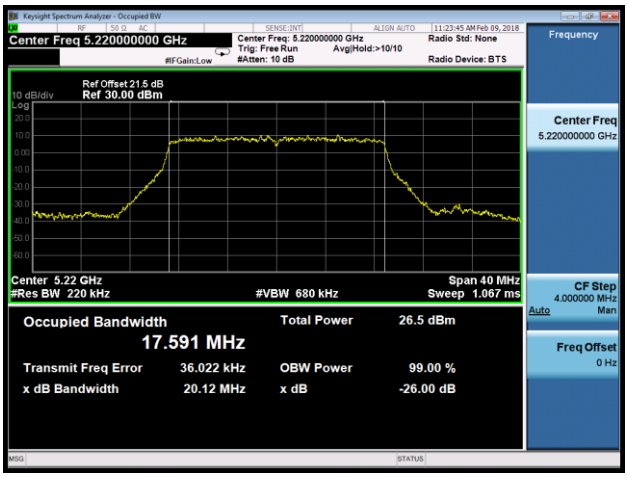
802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3	
Channel 165 (5825MHz)	
	

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

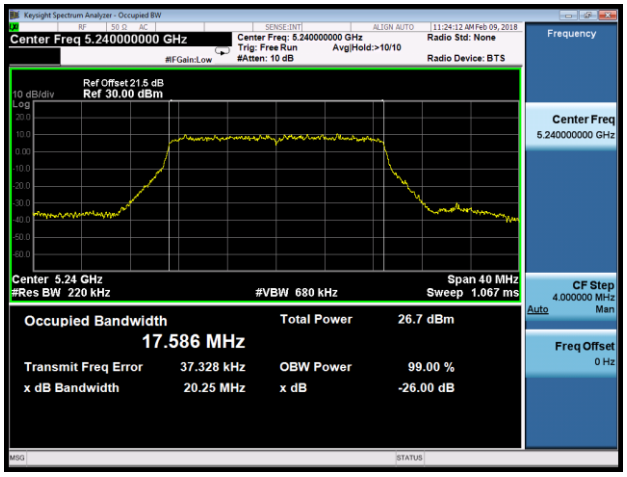
Channel 36 (5180MHz)



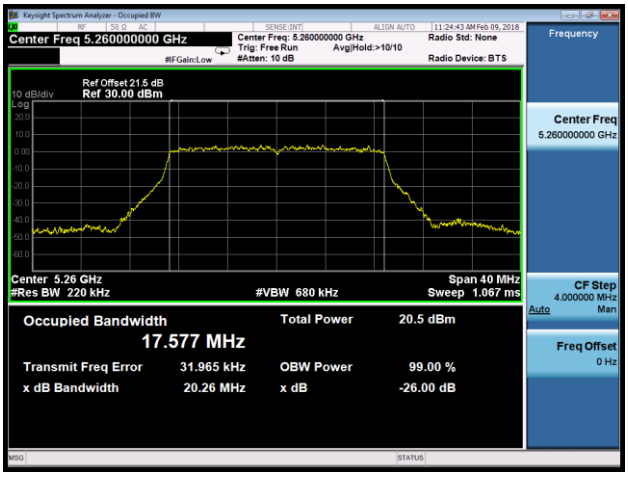
Channel 44 (5220MHz)



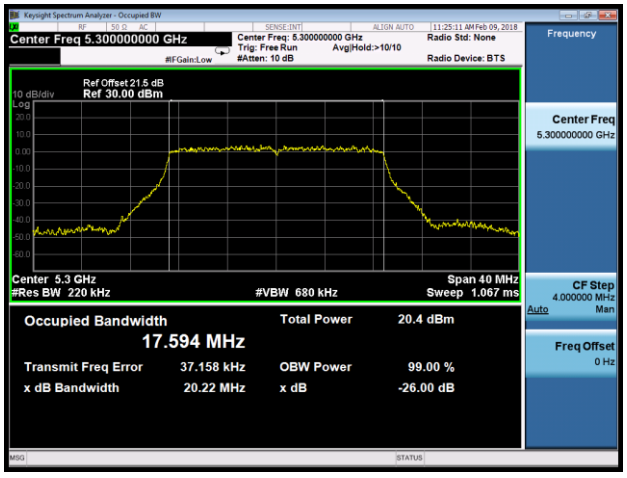
Channel 48 (5240MHz)



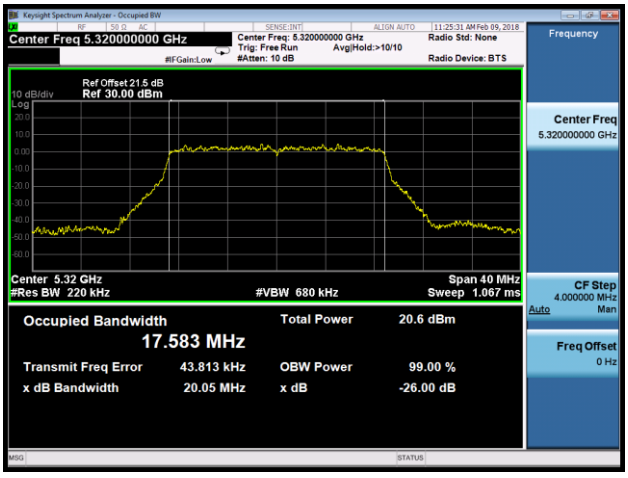
Channel 52 (5260MHz)



Channel 60 (5300MHz)

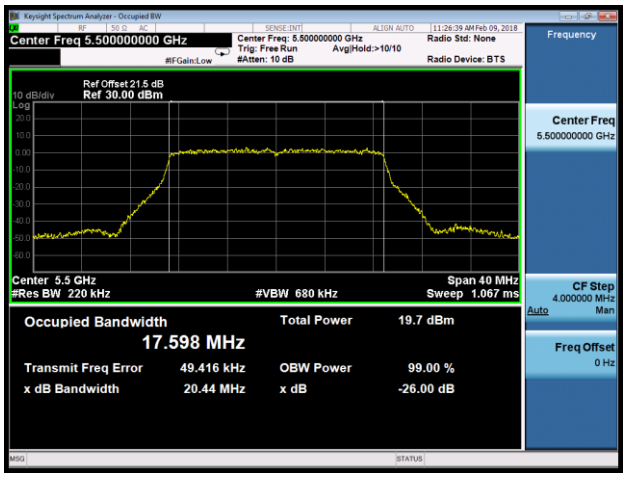


Channel 64 (5320MHz)

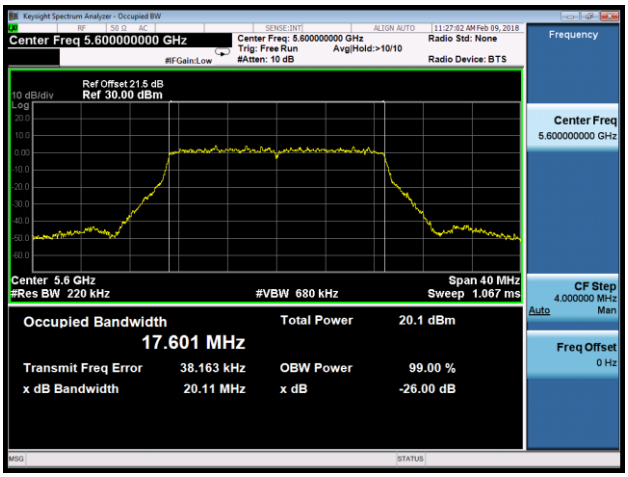


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

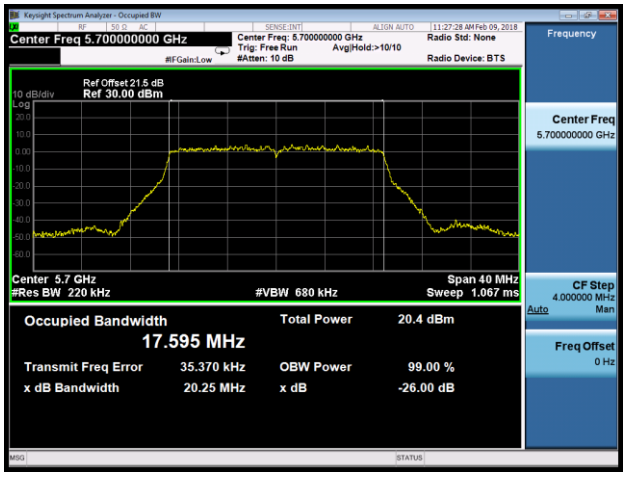
Channel 100 (5500MHz)



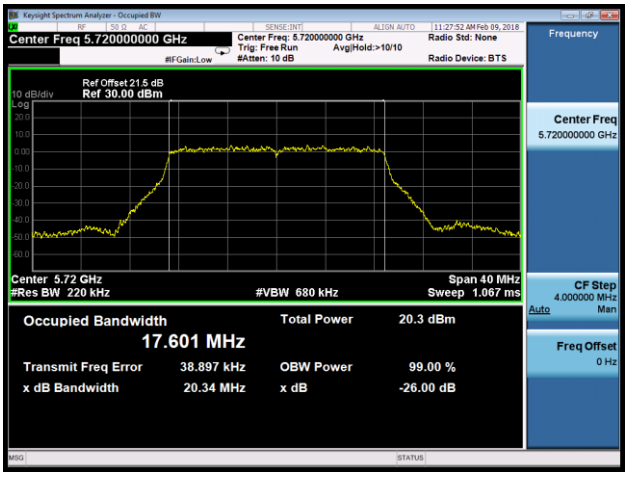
Channel 120 (5600MHz)



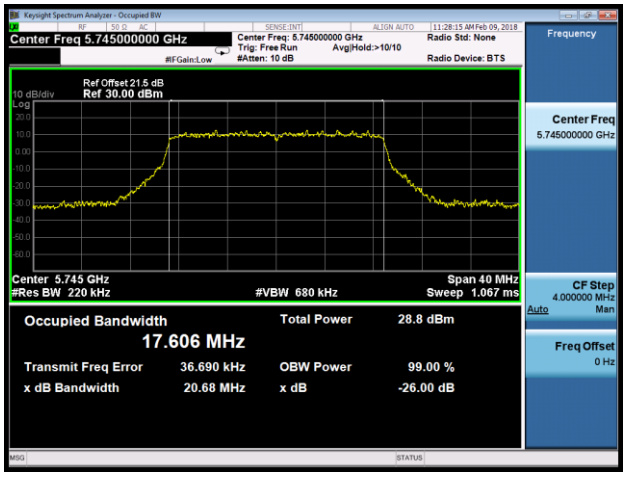
Channel 140 (5700MHz)



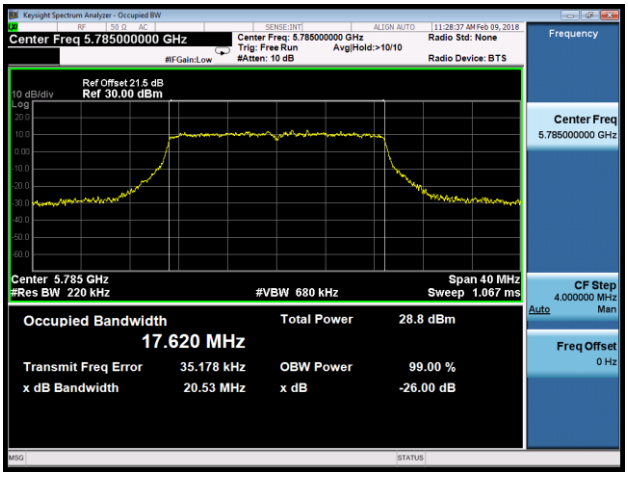
Channel 144 (5720MHz)

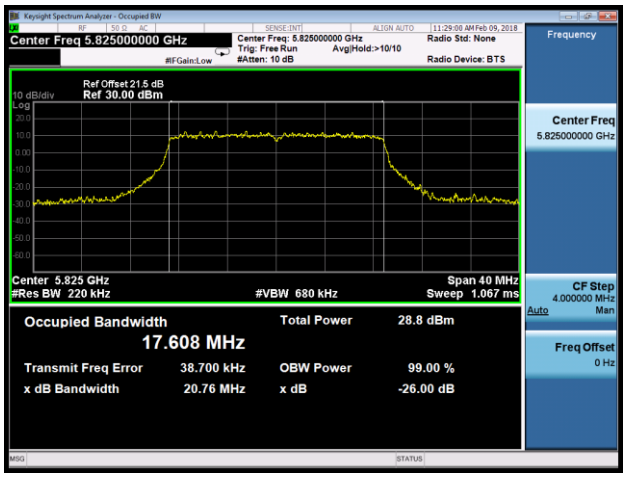


Channel 149 (5745MHz)



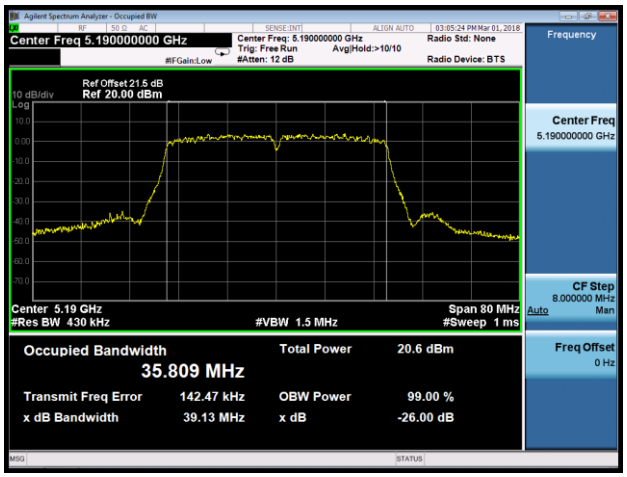
Channel 157 (5785MHz)



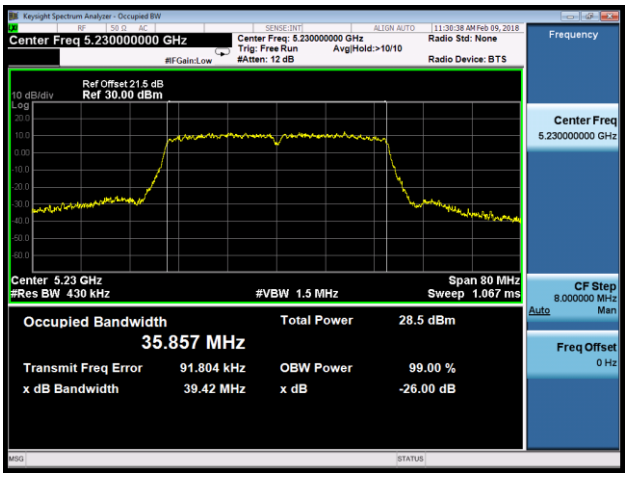
802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3	
Channel 165 (5825MHz)	
	

802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

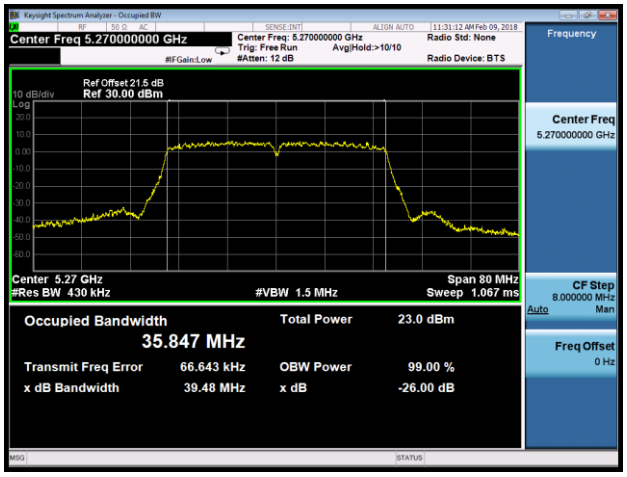
Channel 38 (5190MHz)



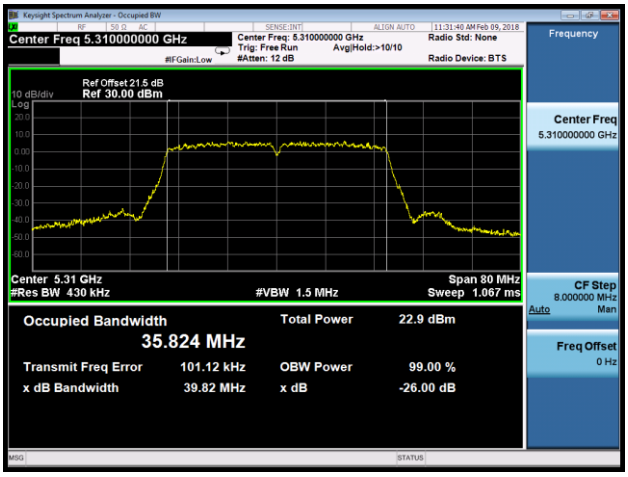
Channel 46 (5230MHz)



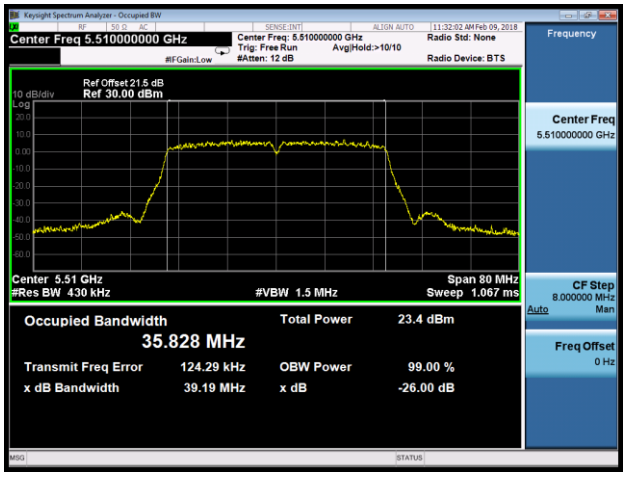
Channel 54 (5270MHz)



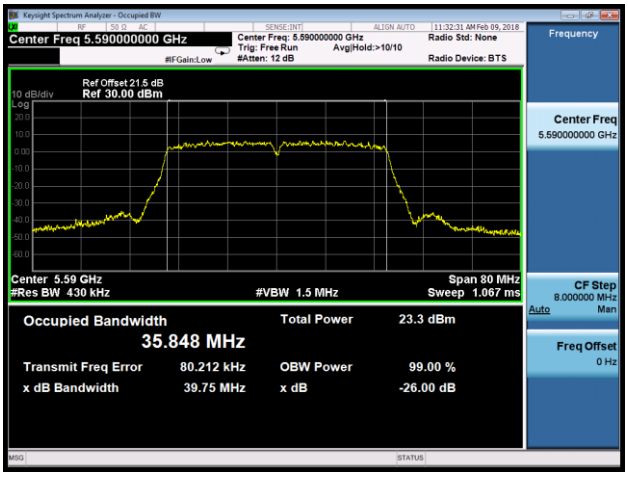
Channel 62 (5310MHz)



Channel 102 (5510MHz)

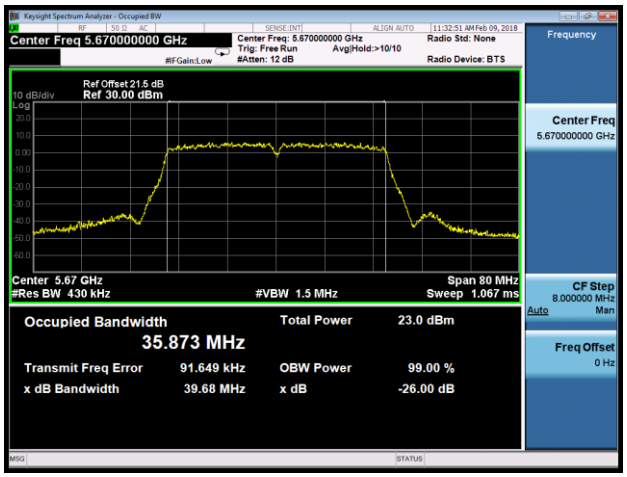


Channel 118 (5590MHz)

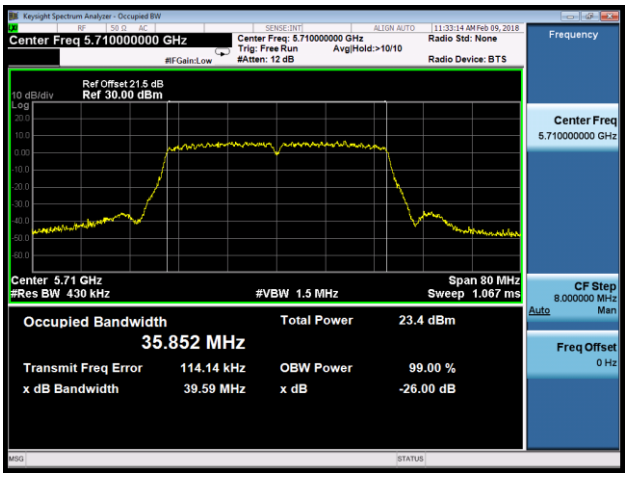


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

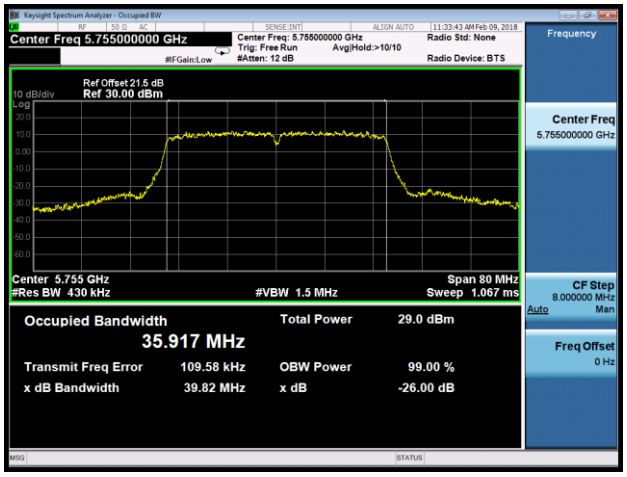
Channel 134 (5670MHz)



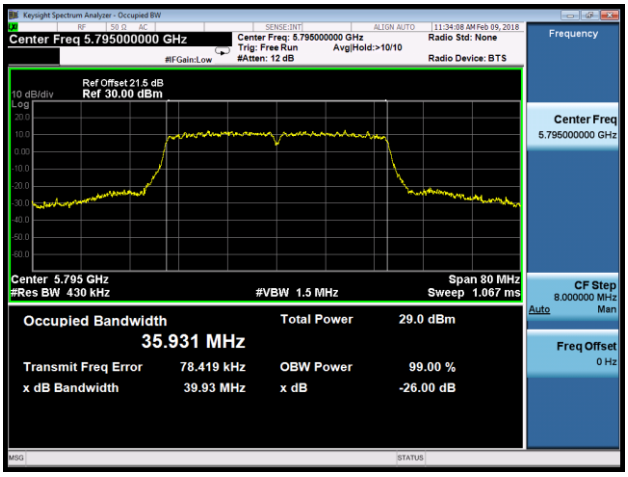
Channel 142 (5710MHz)



Channel 151 (5755MHz)

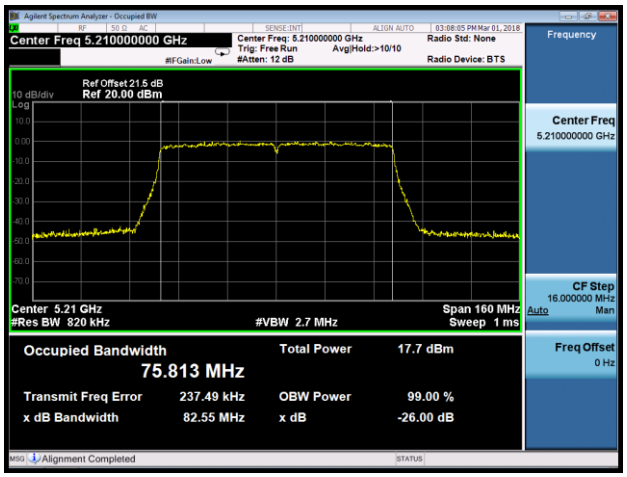


Channel 159 (5795MHz)

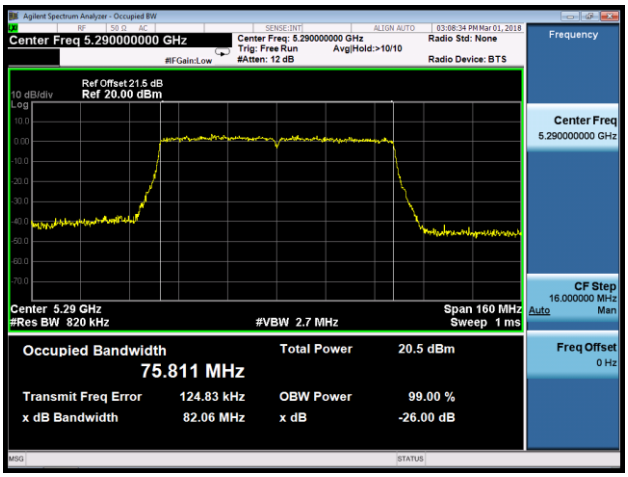


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 + 2 + 3

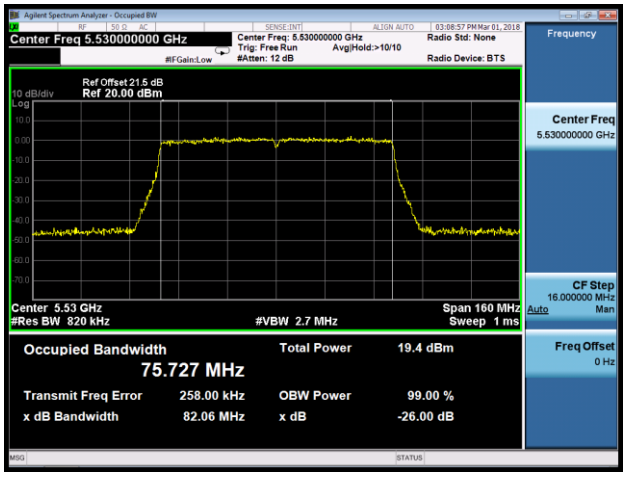
Channel 42 (5210MHz)



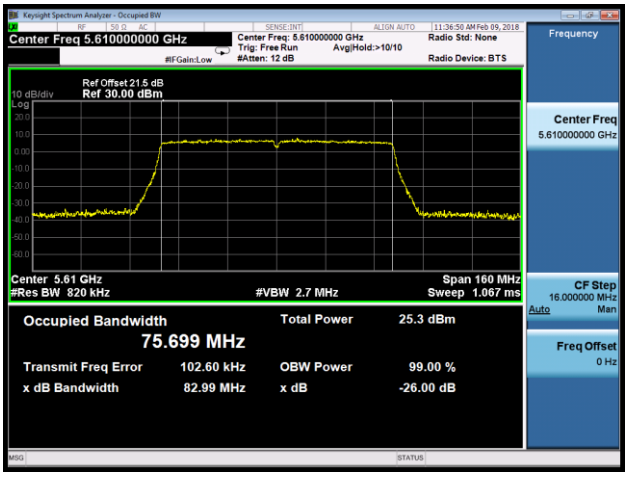
Channel 58 (5290MHz)



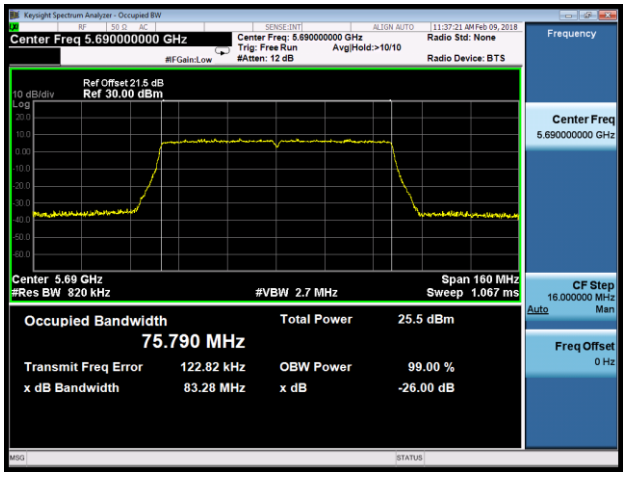
Channel 106 (5530MHz)



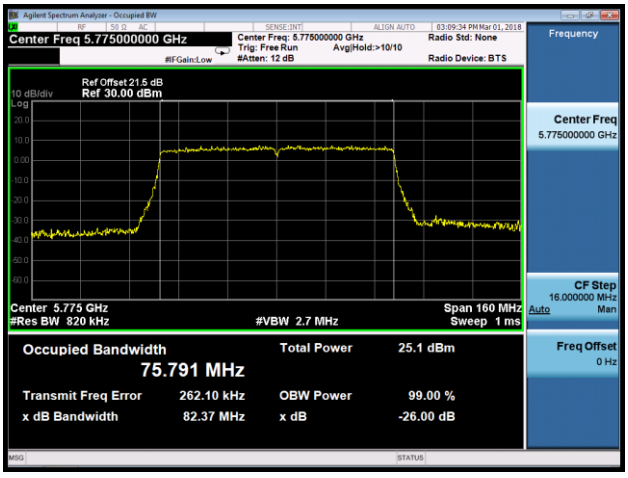
Channel 122 (5610MHz)



Channel 138 (5690MHz)



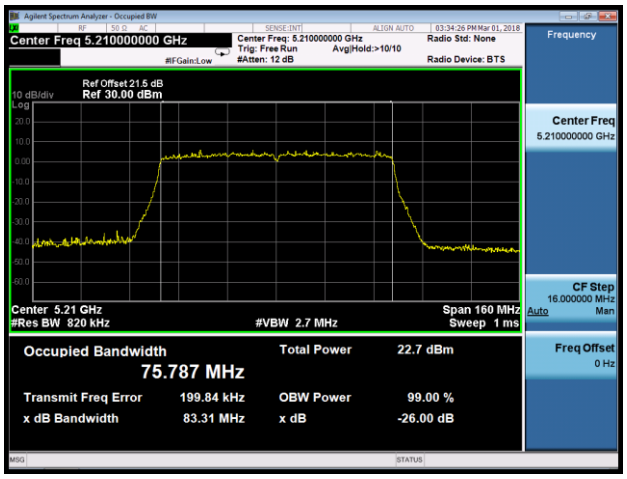
Channel 155 (5775MHz)



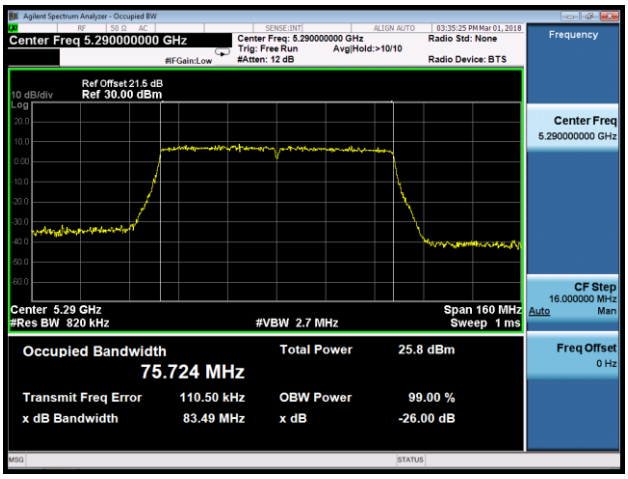
Non-contiguous 80+80 MHz mode

802.11ac-VHT80+80 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1 (Ant 0 + 1 + 2 + 3)

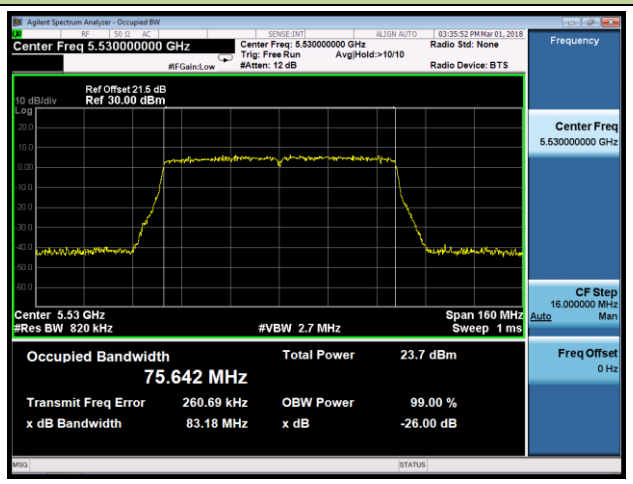
Channel 42 (5210MHz)



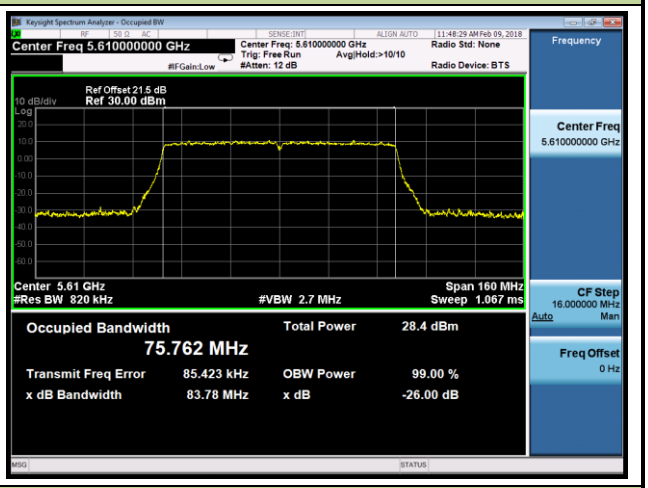
Channel 58 (5290MHz)



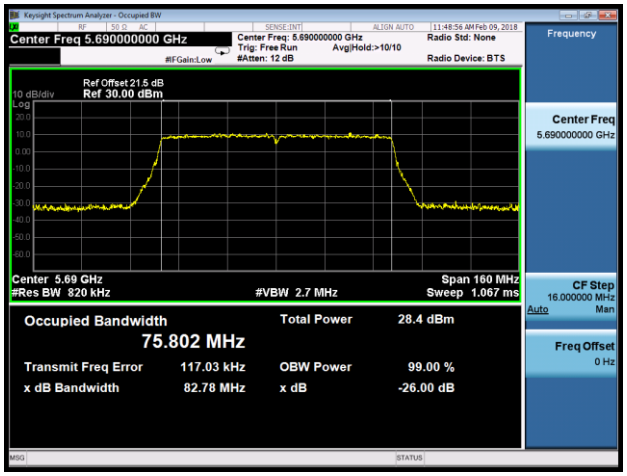
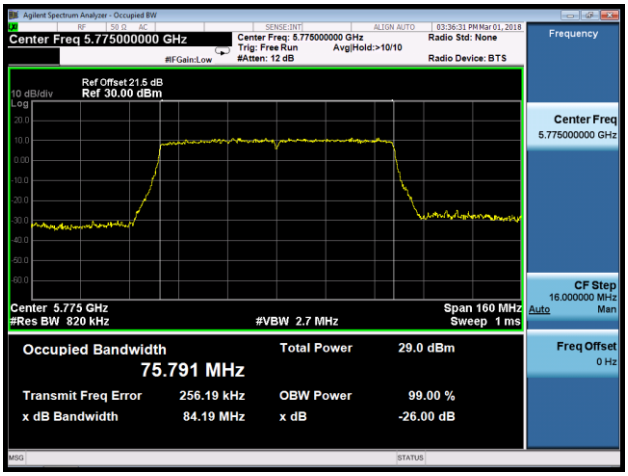
Channel 106 (5530MHz)



Channel 122 (5610MHz)



Channel 138 (5690MHz)



Channel 155 (5775MHz)