MEASUREMENT REPORT

FCC PART 15 Subpart E / RSS-247 WLAN 802.11a/n/ac

FCC ID:	2AD8UFZCWMBOM1
IC:	109D-FZCWMBOM1
APPLICANT:	Nokia Solutions and Networks
Application Type:	Certification
Product:	US Wi-Fi AP 2x2 OD ext. antenna
Model No.:	FZCWMBOM1
Brand Name:	Nokia
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part 15 Subpart E (Section 15.407)
IC Rule(s):	RSS-247 Issue 2, RSS-Gen Issue 4
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02v01r03, KDB 662911 D01v02r01, KDB 644545 D03v01
Test Date:	February 08 ~ March 10, 2017

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 measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v01r03. 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
1703TW0103-U6	Rev. 01	Initial Report	05-14-2017	Valid

CONTENTS

Description Page

§2.1033 General Information

Applicant:	Nokia Solutions and Networks
Applicant Address:	1455 W Shure Drive, Arlington Heights, IL 60004
Manufacturer:	Nokia Solutions and Networks
Manufacturer Address:	1455 W Shure Drive, Arlington Heights, IL 60004
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)
MRT FCC Registration No.:	153292
MRT IC Registration No.:	21723-1
FCC Rule Part(s):	Part 15 Subpart E (Section 15.407)
IC Rule(s):	RSS-247 Issue 2, RSS-Gen Issue 4
Model No.:	FZCWMBOM1
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Unlicensed National Information Infrastructure (UNII)

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.**

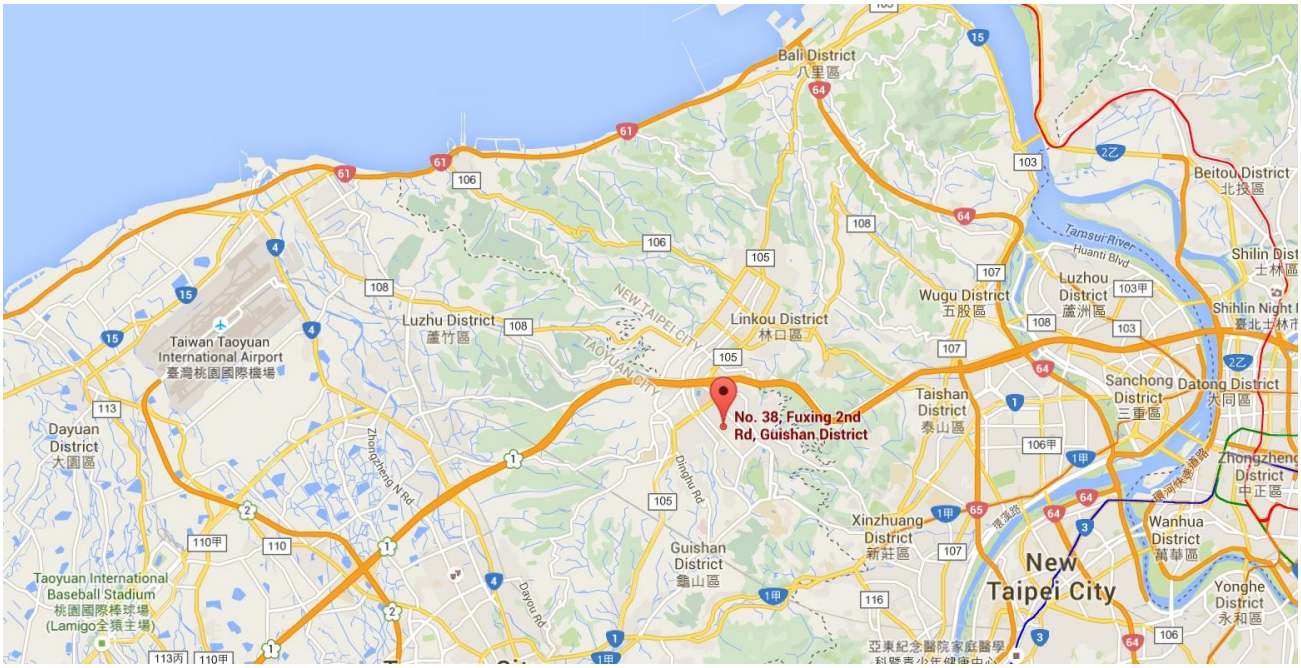
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices 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:	US Wi-Fi AP 2x2 OD ext. antenna
Model No.:	FZCWMBOM1
Brand Name:	Nokia
Hardware Version:	AM2
Wi-Fi Specification:	802.11a/b/g/n/ac
Frequency Range	**2.4GHz:** For 802.11b/g/n-HT20: 2412 ~ 2462 MHz For 802.11n-HT40: 2422 ~ 2452 MHz **5GHz:** For 802.11a/n-HT20: 5180~5320MHz, 5500~5700MHz, 5745~5825MHz For 802.11ac-VHT20: 5180~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40: 5190~5310MHz, 5510~5670MHz, 5755~5795MHz For 802.11ac-VHT40: 5190~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Maximum Output Power	**CDD Mode:** 802.11a: 24.01dBm **Beam-Forming Mode:** 802.11n-HT20: 24.04dBm, 802.11n-HT40: 23.57dBm, 802.11ac-VHT20: 24.04dBm, 802.11ac-VHT40: 23.61dBm, 802.11ac-VHT80: 23.30dBm
Modulation Type	16QAM, 64QAM, QPSK, BPSK for OFDM 802.11a/n/ac: OFDM

2.2. Operation Frequencies and Channel List

802.11a/n-HT20

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

802.11ac-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

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-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

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: The device can’t operate in 5600~5650 MHz band in Canada (The frequency of blue font).

2.3. Description of Available Antennas

Antenna	Manufacturer	Frequency Band (GHz)	Antenna Name	Tx Paths
	Nokia	2.4	473171A / FAWH (WiFi Omni Ant)	2
		5		2

Note: The manufacture has provided an antenna cable to connect WiFi Omni Antenna with EUT, and the cable loss is: 0.45dB Max @ 0~3 GHz; 0.75dB Max @ 0~6 GHz

Antenna Name	Frequency Band (MHz)	Tx Paths	Per Chain Max Antenna Gain (dBi)		Beam Forming Directional Gain (dBi)	CDD Directional Gain (dBi)
			Ant 2	Ant 2		
473171A / FAWH (WiFi Omni Ant)	2412 ~2462	2	4.00	4.00	7.01	7.01
	5150 ~ 5250	2	7.00	7.00	10.01	10.01
	5150 ~ 5250 30°elevation angle	2	7.00	7.00	N/A	N/A
	5250 ~ 5350	2	7.00	7.00	10.01	10.01
	5470 ~ 5725	2	7.00	7.00	10.01	10.01
	5725 ~ 5850	2	7.00	7.00	10.01	10.01

Note

1. The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g mode, and CDD signals are correlated.
2. The EUT supports Beam Forming technology for 802.11n/ac mode.

For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.

Three antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

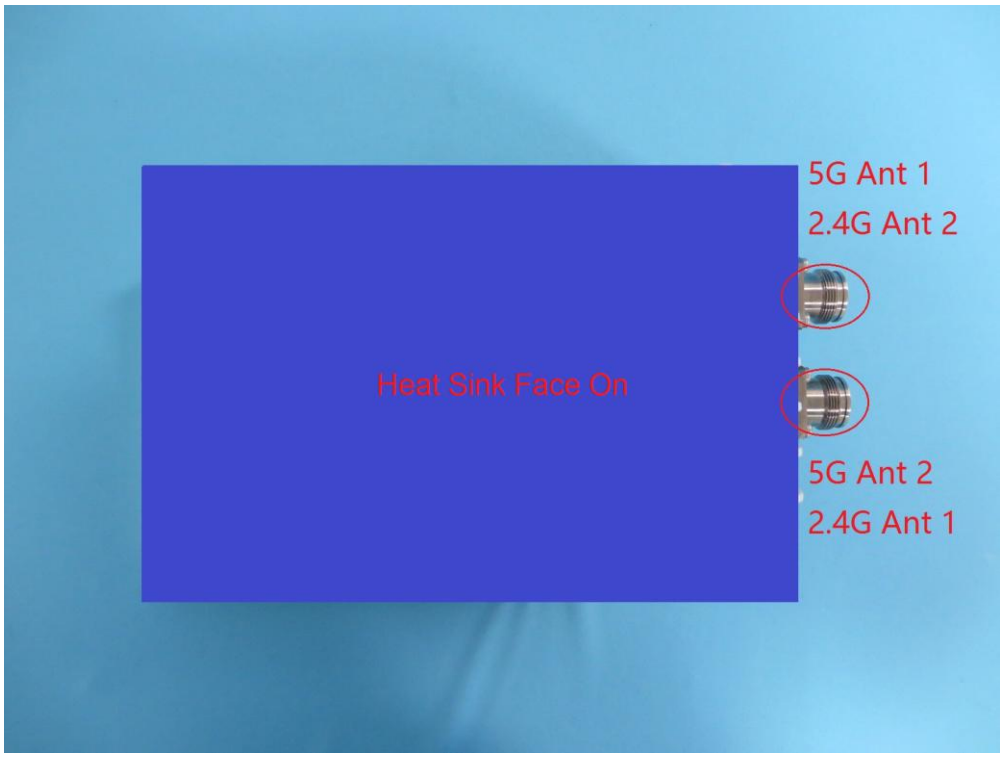
- For power spectral density (PSD) measurements on all devices,
  Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;
- For power measurements on IEEE 802.11 devices,
  Array Gain = 0 dB for $N_{ANT} \leq 4$;

Note 2: The EUT also supports Beam Forming technology, and the Beam Forming only support 802.11ac mode. Two antenna have the same gain, G_{ANT}:

Directional gain = G_{ANT} + 10 log (N_{ANT}/N_{SS}) dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi.

2.4. Description of Antenna RF Port

Antenna RF Port				
---	2.4GHz RF Port		5GHz RF Port	
Software Control Port	Ant 1	Ant 2	Ant 1	Ant 2



2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11a
	Mode 2: Transmit by 802.11n-HT20
	Mode 3: Transmit by 802.11n-HT40
	Mode 4: Transmit by 802.11ac-VHT20
	Mode 5: Transmit by 802.11ac-VHT40
	Mode 6: Transmit by 802.11ac-VHT80

2.6. Test Software

The test utility software used during testing was “QCARCT 3.0.174.0”.

2.7. Device Capabilities

This device contains the following capabilities:
2.4GHz WLAN (DTS) and 5GHz WLAN (NII).
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 = average per the guidance of Section B)2)b) of KDB 789033 D02v01r03. 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	95.10
802.11n-HT20	90.24
802.11n-HT40	81.66
802.11ac-VHT20	89.55
802.11ac-VHT40	82.89
802.11ac-VHT80	72.78

2.8. Test Configuration

The **US Wi-Fi AP 2x2 OD ext. antenna FCC ID: 2AD8UFZCWMBOM1, Model Number: FZCWMBOM1** was tested per the guidance of KDB 789033 D02v01r03. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and 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 pamphlet 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 D02v01r03 were used in the measurement of the **US Wi-Fi AP 2x2 OD ext. antenna FCC ID: 2AD8UFZCWMBOM1, Model Number: FZCWMBOM1.**

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.

Line conducted emissions test results are shown in Section 7.10.

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 turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, 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."

- There are provisions for special connecter (4.3_10 connecter) to an external antenna.

Conclusion:

The **US Wi-Fi AP 2x2 OD ext. antenna FCC ID: 2AD8UFZCWMBOM1, Model Number: FZCWMBOM1** unit complies 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	2017/06/09

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2018/03/02
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	2017/06/09

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2017/07/11
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	2017/06/09

Software	**Version**	**Function**
EMI Software	V3	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
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 40GHz: 4.76dB
Frequency Stability - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.21%
Output Power - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Company Name: **Nokia Solutions and Networks**
FCC ID: **2AD8UFZCWMBOM1**
IC: **109D-FZCWMBOM1**
Model No.: **FZCWMBOM1**
Data Rate(s) Tested: **6Mbps ~ 54Mbps (a);**
6.5/7.2Mbps ~ 130/144.4Mbps (n-HT20);
13.5/15.0Mbps ~ 270/300Mbps (n-HT40);
6.5/7.2Mbps ~ 156/173.4Mbps (ac-VHT20MHz);
13.5/15.0Mbps ~ 360/400Mbps (ac-VHT40MHz);
29.3/32.5Mbps ~ 780/866.6Mbps (ac-VHT80MHz)

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	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(i), (2), (3)	Maximum Conducted Output Power	Refer to Section 7.5		Pass	Section 7.5
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 7.6
15.407(a)(1)(i), (2), (3), (5)	Power Spectral Density	Refer to Section 7.7		Pass	Section 7.7
15.407(g)	Frequency Stability	N/A		Pass	Section 7.8
15.407(b)(1), (4)	Undesirable Emissions	≤ -27dBm/MHz EIRP ≤ -17dBm/MHz EIRP	Radiated	Pass	Section 7.9 & 7.10
15.205, 15.209 15.407(b)(5), (6), (7)	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 7.11

RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
RSS-247 §6.2	99% Bandwidth	N/A	Conducted	Pass	Section 7.2
RSS-247 §6.2.4	6dB Bandwidth	>500kHz		Pass	Section 7.3
RSS-247 §6.2.1	Operation Frequency Range of 26dB BW	26dBc frequency range above 5250MHz		Pass	Section 7.4
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Max Conducted Output Power	5250~5250, 5470~5725MHz ≤ 250 mW or 11 + 10 log10(99% B) 5725~5850MHz, ≤ 30 dBm		Pass	Section 7.5
	Maximum E.I.R.P	5150~5250MHz ≤ 23 dBm or 10 + 10 log10(99% B) 5250~5250, 5470~5725MHz ≤ 30 dBm or 17 + 10 log10(99% B)			
RSS-247 §6.2.2, §6.2.3	Transmit Power Control	≤ 24 dBm		Pass	Section 7.6
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Peak E.I.R.P Power Spectral Density	5150~5250MHz ≤ 10 dBm/MHz		Pass	Section 7.7
	Peak Power Spectral Density	5250~5250, 5470~5725MHz ≤ 11 dBm/MHz 5725~5850MHz ≤ 30 dBm/500kHz			
RSS-Gen [8.11]	Frequency Stability	N/A		Pass	Section 7.8
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Out-of-Band Emissions	≤ -27dBm/MHz EIRP ≤ -17dBm/MHz EIRP	Radiated	Pass	Section 7.9 & 7.10
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in RSS-Gen [8.9]		Pass	
RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	< RSS-Gen [8.8] limits	Line Conducted	Pass	Section 7.11

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
2) 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.
3) Test Items “26dB Bandwidth”, “6dB Bandwidth” have been assessed SISO and MIMO transmission, and showed the worst test data in this report.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

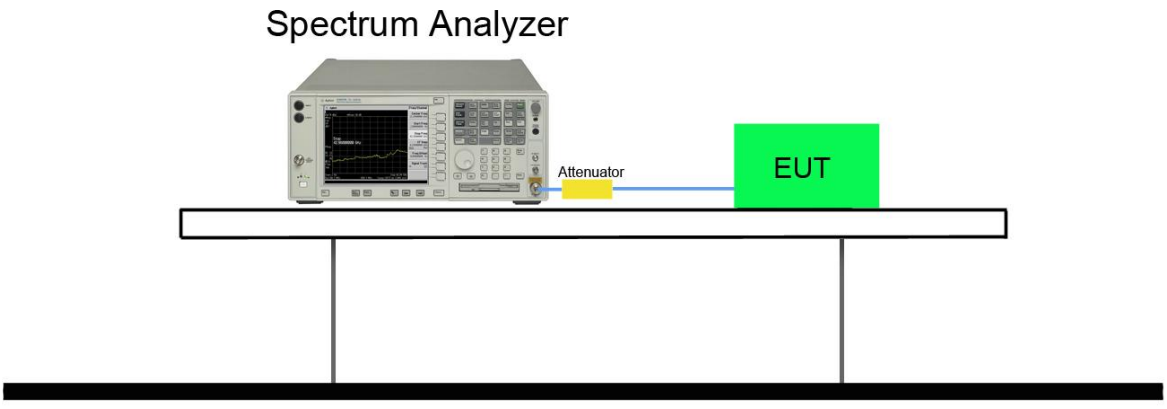
7.2.2. Test Procedure used

KDB 789033 D02v01r03 - 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	US Wi-Fi AP 2x2 OD ext. antenna	Test Engineer	Johnson Liao
Test Site	SR2	Test Date	2017/02/18
Test Item	26dB Bandwidth		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 1					
802.11a	6	36	5180	21.33	16.58
802.11a	6	44	5220	23.72	16.71
802.11a	6	48	5240	22.30	16.67
802.11a	6	52	5260	21.28	16.62
802.11a	6	60	5300	21.34	16.61
802.11a	6	64	5320	22.11	16.61
802.11a	6	100	5500	20.88	16.59
802.11a	6	116	5580	21.23	16.63
802.11a	6	120	5600	21.28	16.65
802.11a	6	140	5700	21.58	16.58
802.11a	6	149	5745	21.83	16.64
802.11a	6	157	5785	22.20	16.66
802.11a	6	165	5825	21.60	16.65
802.11n-HT20	6.5	36	5180	21.92	17.72
802.11n-HT20	6.5	44	5220	23.23	17.86
802.11n-HT20	6.5	48	5240	23.77	17.83
802.11n-HT20	6.5	52	5260	21.95	17.79
802.11n-HT20	6.5	60	5300	22.60	17.76
802.11n-HT20	6.5	64	5320	22.26	17.78
802.11n-HT20	6.5	100	5500	22.04	17.75
802.11n-HT20	6.5	116	5580	22.01	17.76
802.11n-HT20	6.5	120	5600	22.06	17.77
802.11n-HT20	6.5	140	5700	22.14	17.75
802.11n-HT20	6.5	149	5745	22.84	17.77
802.11n-HT20	6.5	157	5785	22.35	17.78
802.11n-HT20	6.5	165	5825	23.83	17.77

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 1					
802.11n-HT40	13.5	38	5190	42.91	36.26
802.11n-HT40	13.5	46	5230	44.62	36.33
802.11n-HT40	13.5	54	5270	42.63	36.28
802.11n-HT40	13.5	62	5310	42.37	36.30
802.11n-HT40	13.5	102	5510	42.35	36.31
802.11n-HT40	13.5	110	5550	43.66	36.51
802.11n-HT40	13.5	118	5590	46.01	36.36
802.11n-HT40	13.5	134	5670	42.82	36.33
802.11n-HT40	13.5	151	5755	43.22	36.31
802.11n-HT40	13.5	159	5795	42.93	36.31
802.11ac-VHT20	6.5	36	5180	21.87	17.75
802.11ac-VHT20	6.5	44	5220	23.88	17.82
802.11ac-VHT20	6.5	48	5240	23.77	17.80
802.11ac-VHT20	6.5	52	5260	22.36	17.78
802.11ac-VHT20	6.5	60	5300	21.99	17.74
802.11ac-VHT20	6.5	64	5320	22.25	17.75
802.11ac-VHT20	6.5	100	5500	21.84	17.74
802.11ac-VHT20	6.5	116	5580	22.49	17.85
802.11ac-VHT20	6.5	120	5600	22.44	17.76
802.11ac-VHT20	6.5	140	5700	21.59	17.74
802.11ac-VHT20	6.5	144	5720	22.72	17.75
802.11ac-VHT20	6.5	149	5745	22.81	17.80
802.11ac-VHT20	6.5	157	5785	22.30	17.79
802.11ac-VHT20	6.5	165	5825	22.39	17.77

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 1					
802.11ac-VHT40	13.5	38	5190	43.58	36.27
802.11ac-VHT40	13.5	46	5230	44.53	36.37
802.11ac-VHT40	13.5	54	5270	43.03	36.33
802.11ac-VHT40	13.5	62	5310	42.50	36.33
802.11ac-VHT40	13.5	102	5510	43.42	36.35
802.11ac-VHT40	13.5	110	5550	43.66	36.46
802.11ac-VHT40	13.5	118	5590	45.32	36.42
802.11ac-VHT40	13.5	134	5670	42.69	36.35
802.11ac-VHT40	13.5	142	5710	43.02	36.34
802.11ac-VHT40	13.5	151	5755	42.61	36.29
802.11ac-VHT40	13.5	159	5795	44.42	36.36
802.11ac-VHT80	29.3	42	5210	86.27	75.82
802.11ac-VHT80	29.3	58	5290	85.24	75.87
802.11ac-VHT80	29.3	106	5530	82.55	75.76
802.11ac-VHT80	29.3	122	5610	85.10	75.98
802.11ac-VHT80	29.3	138	5690	84.80	75.87
802.11ac-VHT80	29.3	155	5775	84.90	75.76

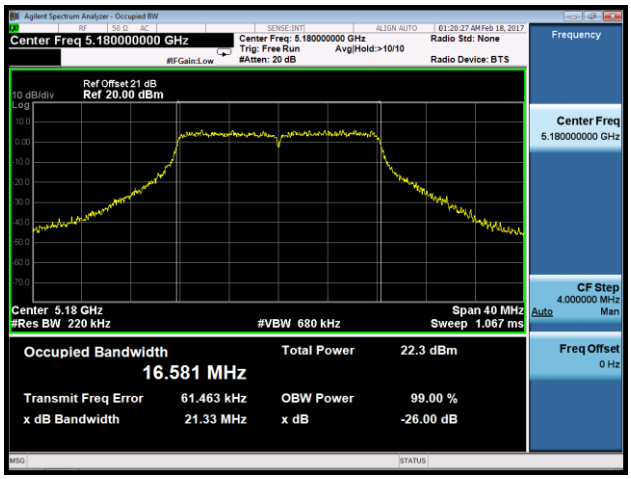
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 2					
802.11a	6	36	5180	21.85	16.60
802.11a	6	44	5220	25.67	16.88
802.11a	6	48	5240	24.08	16.77
802.11a	6	52	5260	21.34	16.61
802.11a	6	60	5300	20.38	16.60
802.11a	6	64	5320	21.06	16.61
802.11a	6	100	5500	21.08	16.58
802.11a	6	116	5580	21.52	16.65
802.11a	6	120	5600	21.02	16.59
802.11a	6	140	5700	21.03	16.58
802.11a	6	149	5745	21.06	16.61
802.11a	6	157	5785	21.50	16.63
802.11a	6	165	5825	22.12	16.61
802.11n-HT20	6.5	36	5180	22.04	17.74
802.11n-HT20	6.5	44	5220	24.86	17.94
802.11n-HT20	6.5	48	5240	25.10	17.89
802.11n-HT20	6.5	52	5260	22.43	17.74
802.11n-HT20	6.5	60	5300	22.39	17.76
802.11n-HT20	6.5	64	5320	21.54	17.75
802.11n-HT20	6.5	100	5500	21.39	17.76
802.11n-HT20	6.5	116	5580	22.73	17.77
802.11n-HT20	6.5	120	5600	22.13	17.72
802.11n-HT20	6.5	140	5700	21.77	17.76
802.11n-HT20	6.5	149	5745	21.96	17.77
802.11n-HT20	6.5	157	5785	22.71	17.75
802.11n-HT20	6.5	165	5825	22.14	17.78

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 2					
802.11n-HT40	13.5	38	5190	41.62	36.26
802.11n-HT40	13.5	46	5230	50.81	36.45
802.11n-HT40	13.5	54	5270	44.96	36.38
802.11n-HT40	13.5	62	5310	43.05	36.35
802.11n-HT40	13.5	102	5510	42.68	36.31
802.11n-HT40	13.5	110	5550	47.45	36.60
802.11n-HT40	13.5	118	5590	42.52	36.41
802.11n-HT40	13.5	134	5670	43.79	36.33
802.11n-HT40	13.5	151	5755	42.53	36.36
802.11n-HT40	13.5	159	5795	43.01	36.34
802.11ac-VHT20	6.5	36	5180	22.98	17.77
802.11ac-VHT20	6.5	44	5220	25.23	17.90
802.11ac-VHT20	6.5	48	5240	24.47	17.89
802.11ac-VHT20	6.5	52	5260	21.96	17.74
802.11ac-VHT20	6.5	60	5300	21.66	17.75
802.11ac-VHT20	6.5	64	5320	22.24	17.74
802.11ac-VHT20	6.5	100	5500	22.54	17.76
802.11ac-VHT20	6.5	116	5580	22.94	17.79
802.11ac-VHT20	6.5	120	5600	21.80	17.75
802.11ac-VHT20	6.5	140	5700	21.91	17.74
802.11ac-VHT20	6.5	144	5720	22.51	17.76
802.11ac-VHT20	6.5	149	5745	22.84	17.77
802.11ac-VHT20	6.5	157	5785	23.02	17.79
802.11ac-VHT20	6.5	165	5825	22.13	17.77

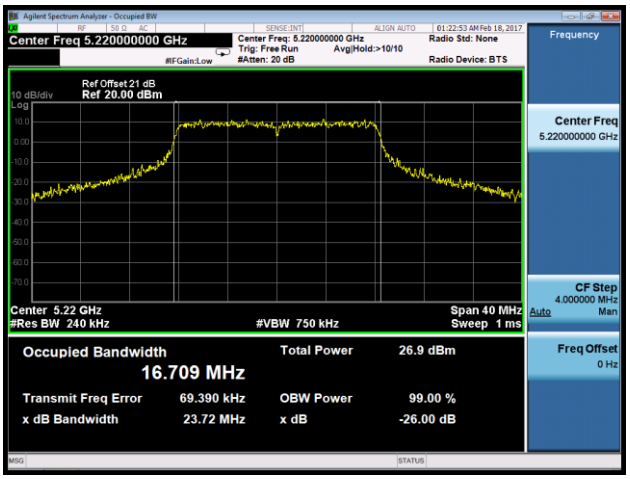
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 2					
802.11ac-VHT40	13.5	38	5190	42.13	36.31
802.11ac-VHT40	13.5	46	5230	46.57	36.48
802.11ac-VHT40	13.5	54	5270	43.05	36.37
802.11ac-VHT40	13.5	62	5310	42.27	36.26
802.11ac-VHT40	13.5	102	5510	41.66	36.30
802.11ac-VHT40	13.5	110	5550	44.91	36.50
802.11ac-VHT40	13.5	118	5590	43.32	36.33
802.11ac-VHT40	13.5	134	5670	42.77	36.35
802.11ac-VHT40	13.5	142	5710	43.76	36.39
802.11ac-VHT40	13.5	151	5755	43.32	36.32
802.11ac-VHT40	13.5	159	5795	43.14	36.33
802.11ac-VHT80	29.3	42	5210	84.59	75.71
802.11ac-VHT80	29.3	58	5290	84.74	75.93
802.11ac-VHT80	29.3	106	5530	84.86	75.78
802.11ac-VHT80	29.3	122	5610	86.81	75.97
802.11ac-VHT80	29.3	122	5610	96.57	75.97
802.11ac-VHT80	29.3	138	5690	84.48	75.79
802.11ac-VHT80	29.3	155	5775	84.48	75.79

802.11a 26dB Bandwidth & 99% Bandwidth - Ant 1

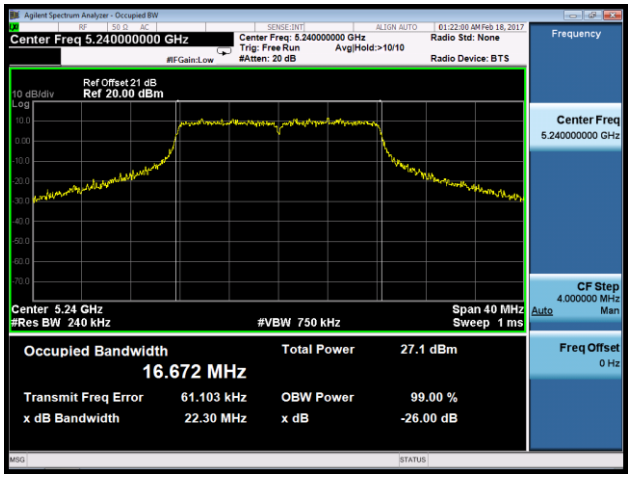
Channel 36 (5180MHz)



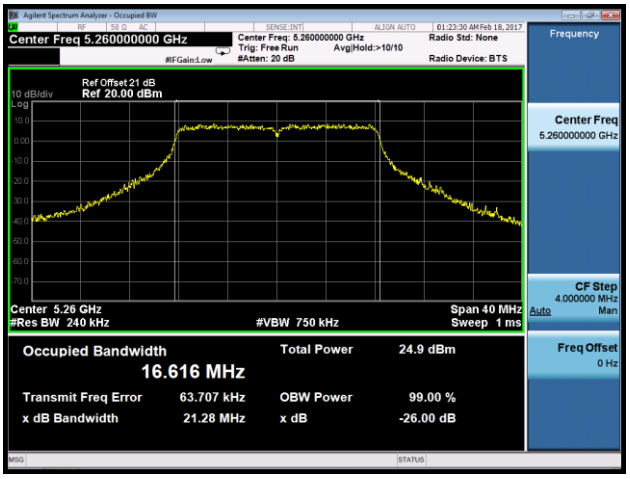
Channel 44 (5220MHz)



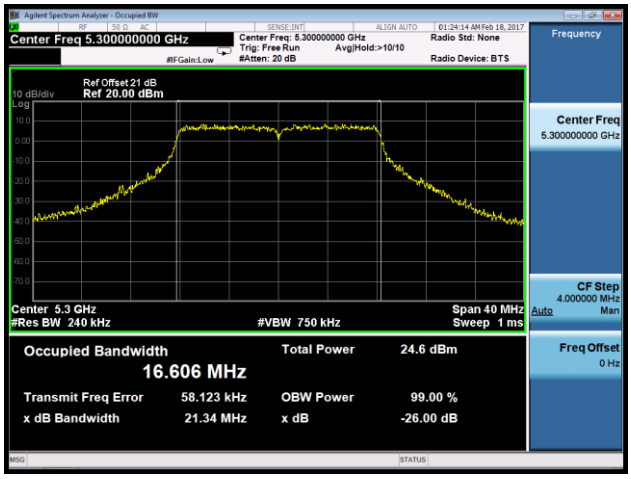
Channel 48 (5240MHz)



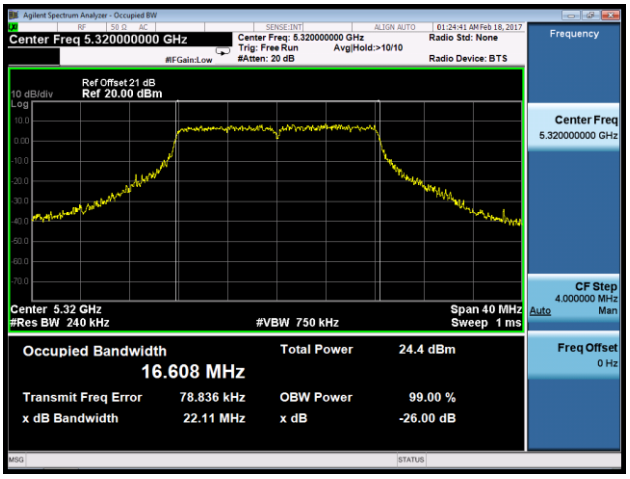
Channel 52 (5260MHz)

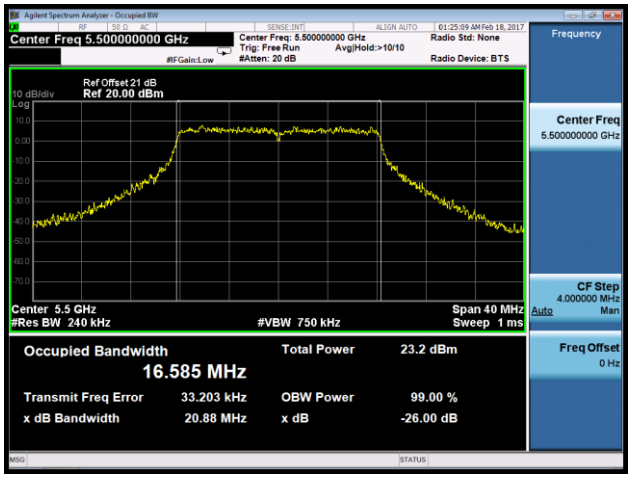
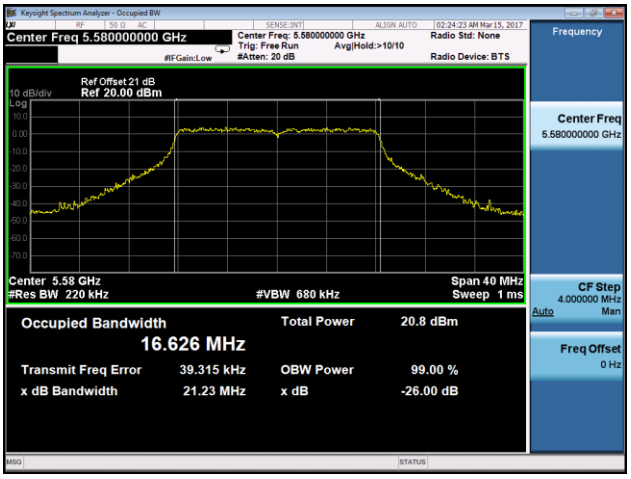
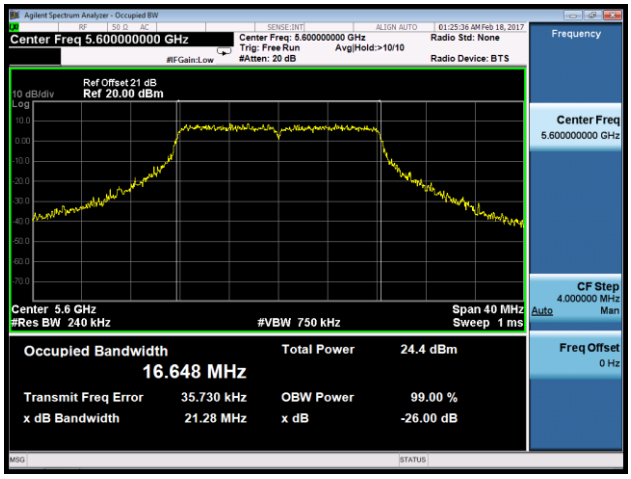
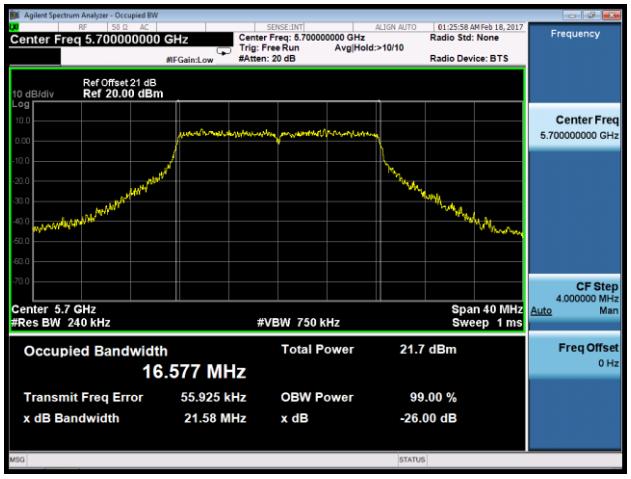
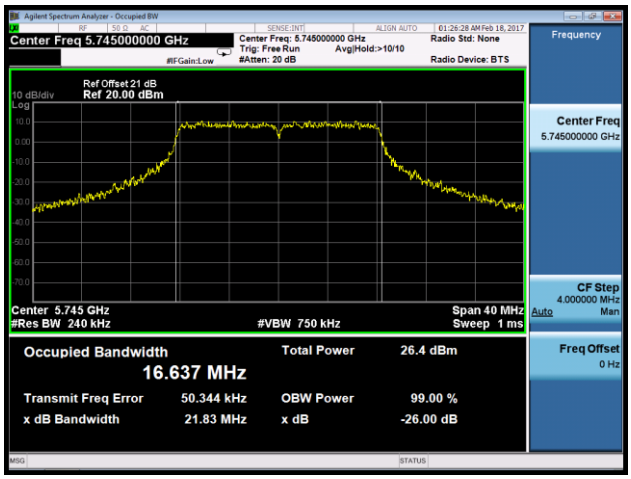
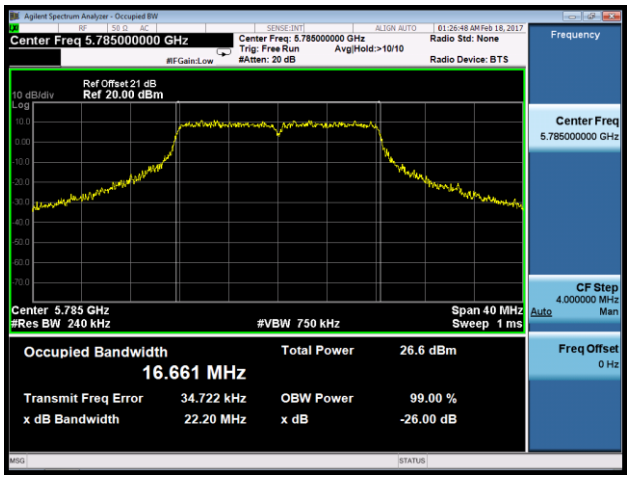


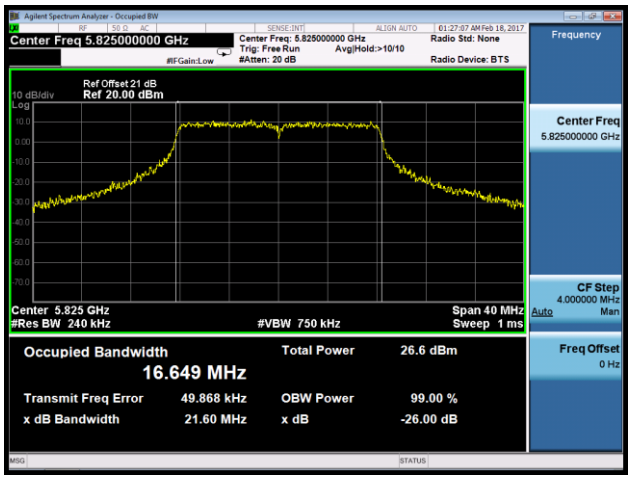
Channel 60 (5300MHz)



Channel 64 (5320MHz)

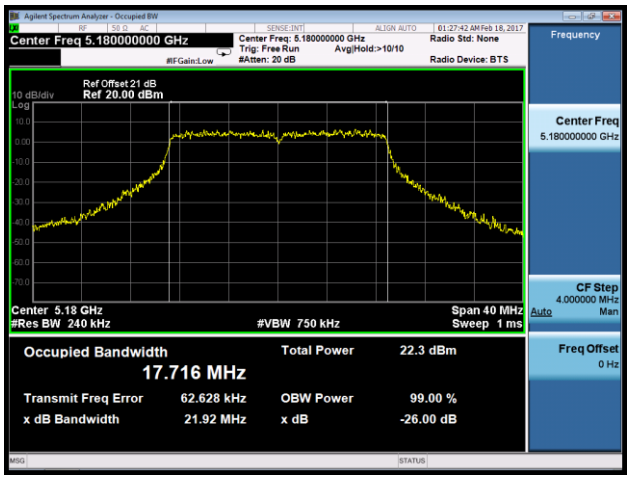


Channel 100 (5500MHz)	Channel 116 (5580MHz)
	
Channel 120 (5600MHz)	**Channel 140 (5700MHz)**
	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	

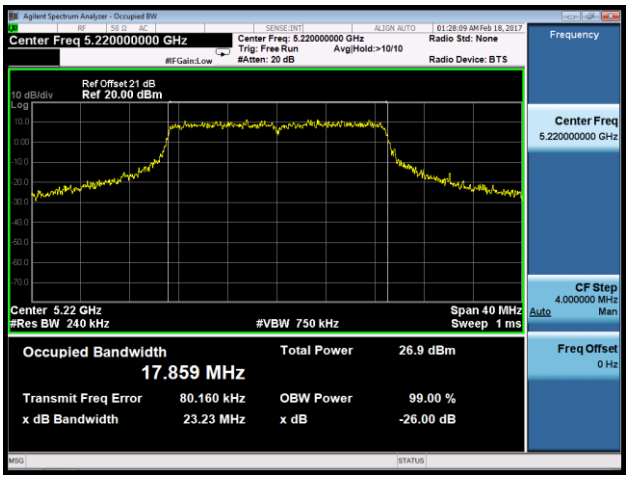
Channel 165 (5825MHz)	
	

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

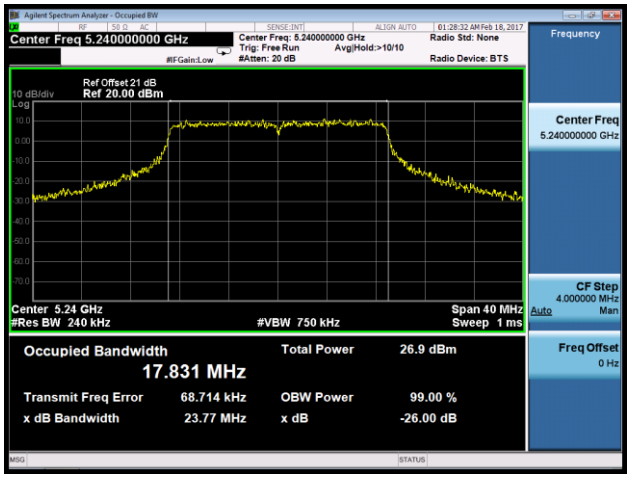
Channel 36 (5180MHz)



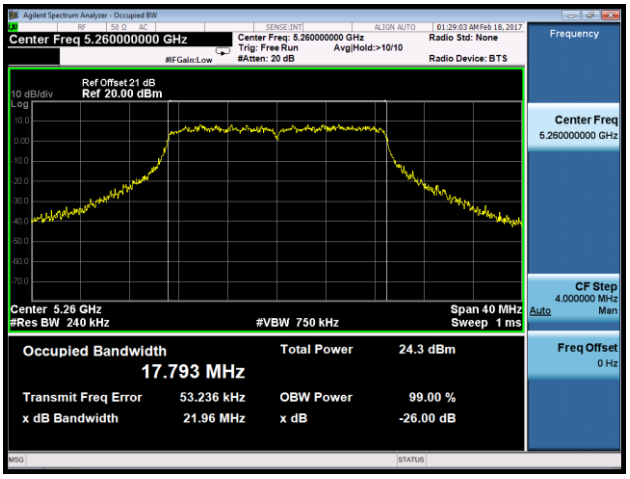
Channel 44 (5220MHz)



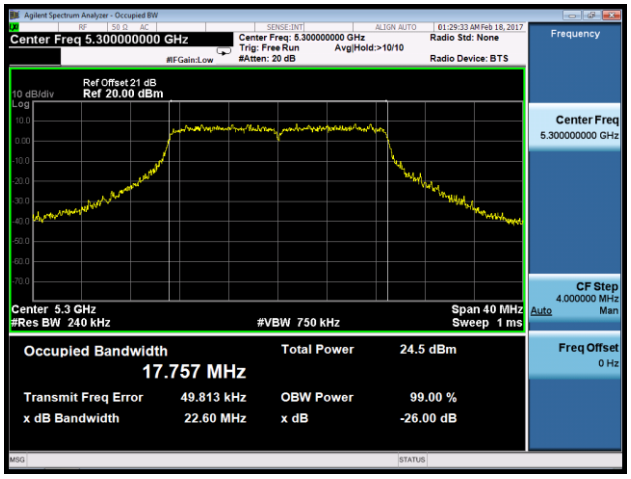
Channel 48 (5240MHz)



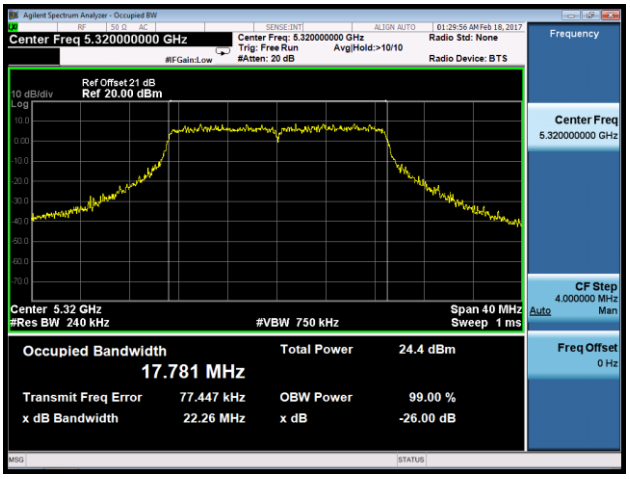
Channel 52 (5260MHz)

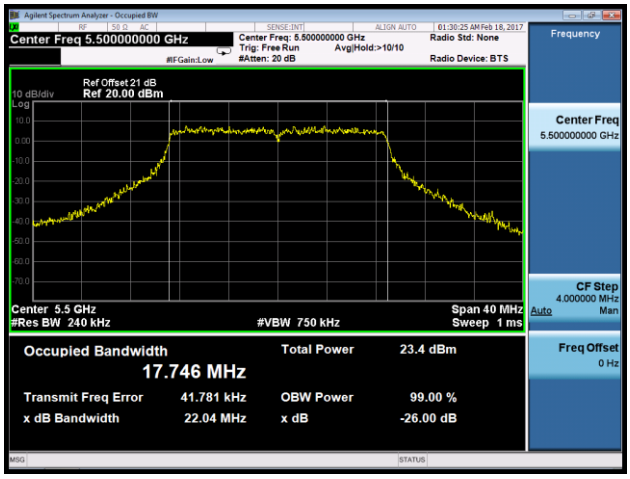
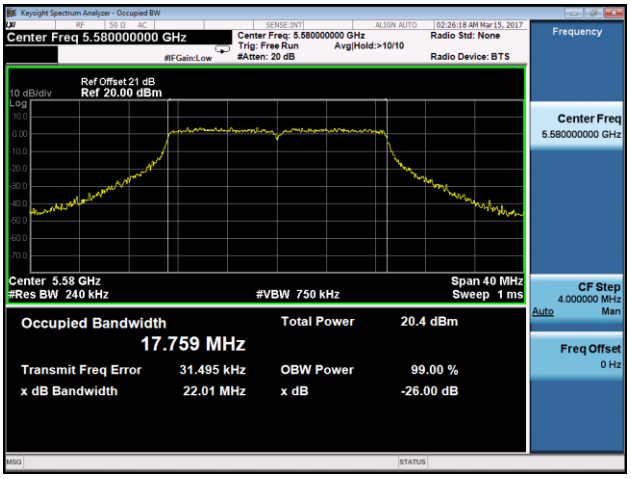
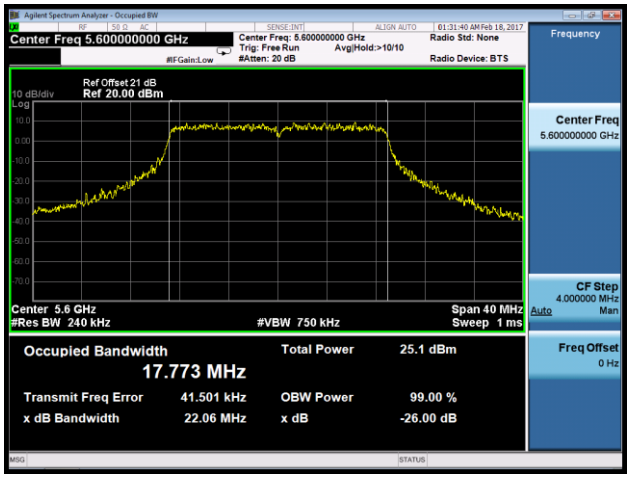
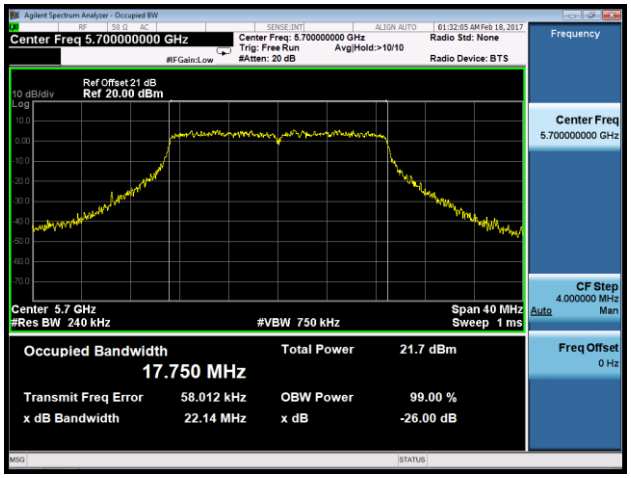
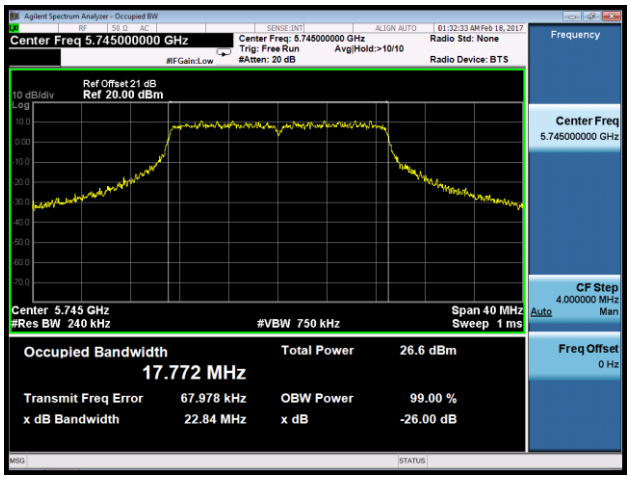
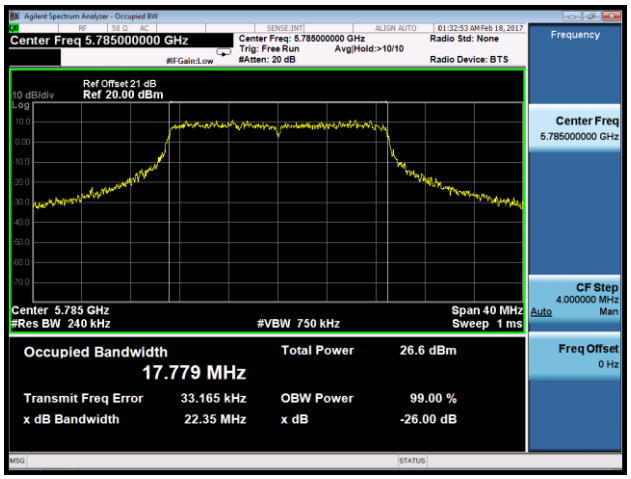


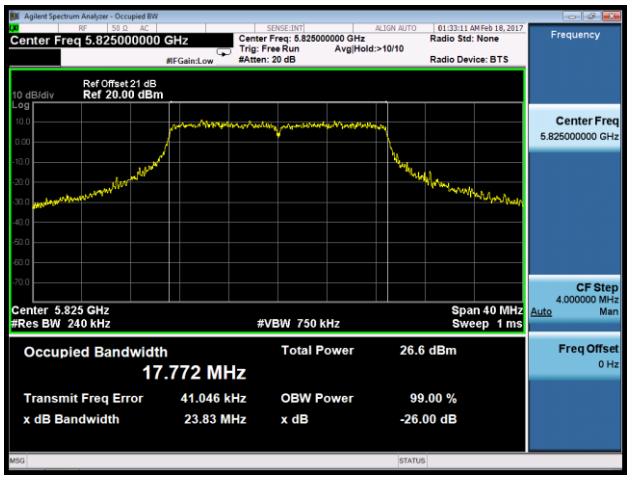
Channel 60 (5300MHz)



Channel 64 (5320MHz)

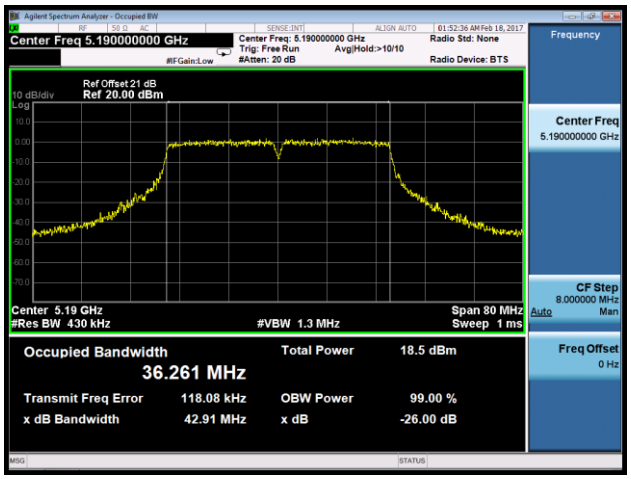


Channel 100 (5500MHz)	Channel 116 (5580MHz)
	
Channel 120 (5600MHz)	**Channel 140 (5700MHz)**
	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	

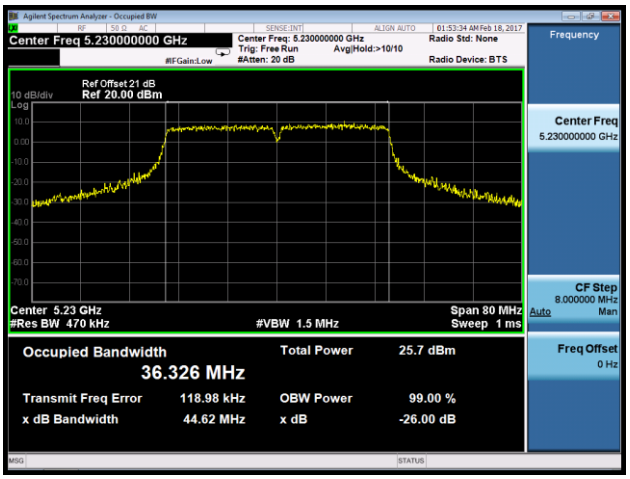
Channel 165 (5825MHz)	
	

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

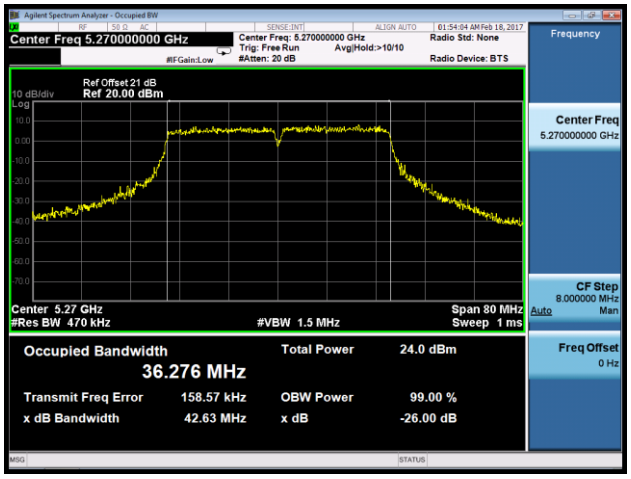
Channel 38 (5190MHz)



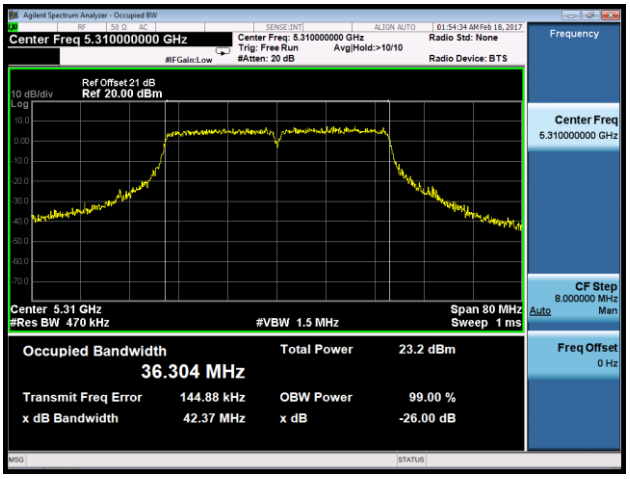
Channel 46 (5230MHz)



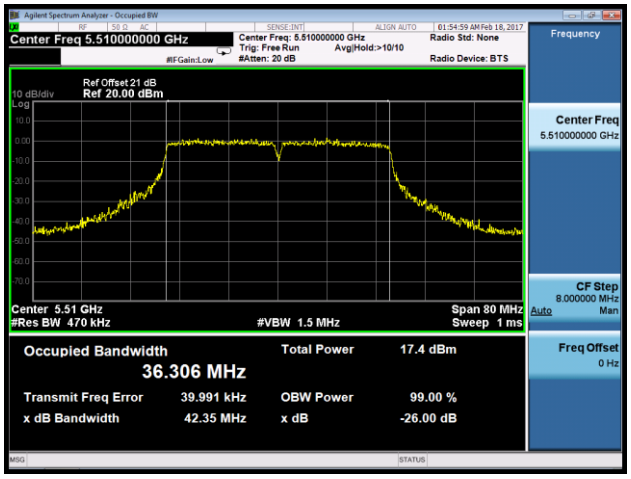
Channel 54 (5270MHz)



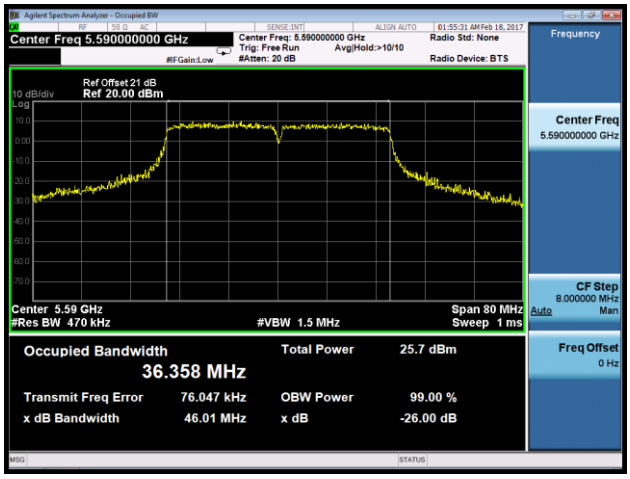
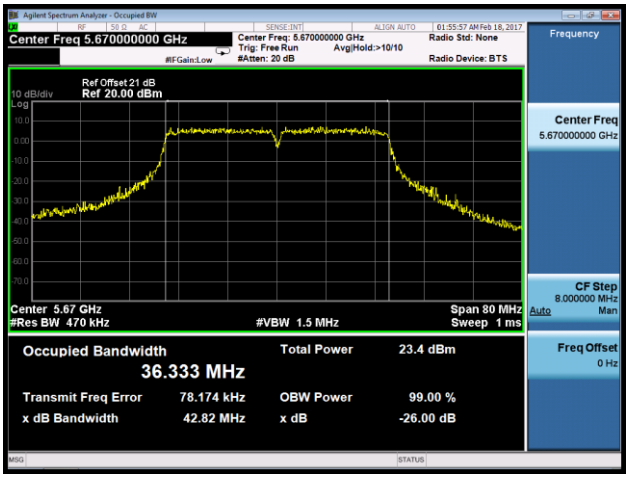
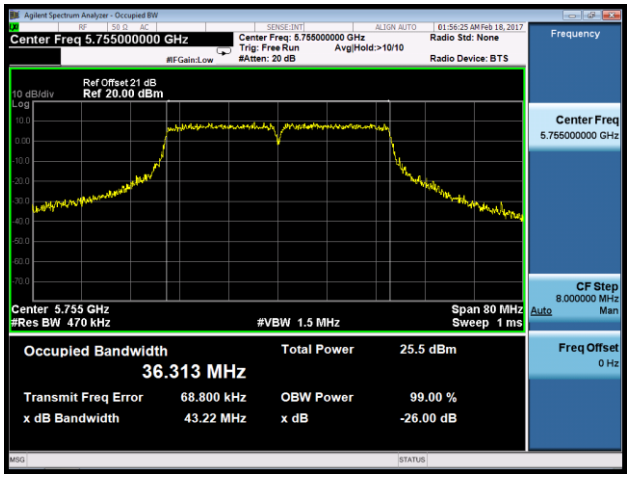
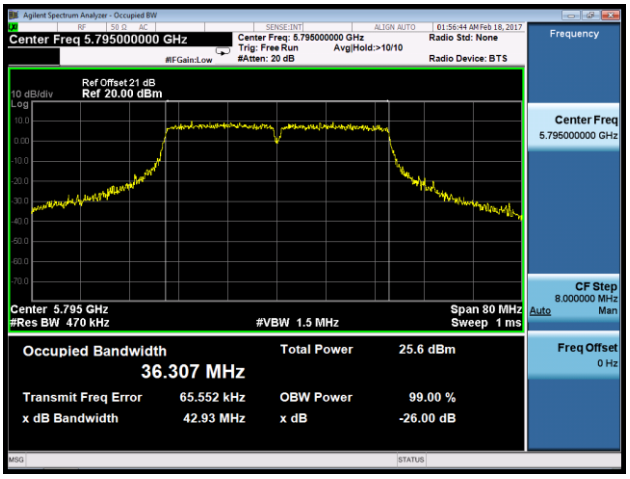
Channel 62 (5310MHz)



Channel 102 (5510MHz)

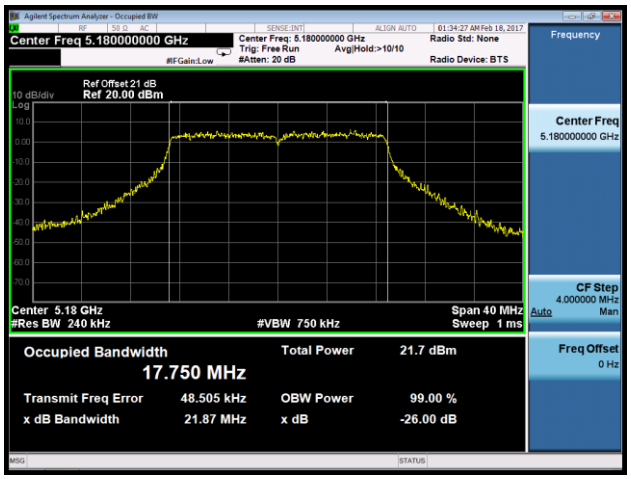


Channel 110 (5550MHz)

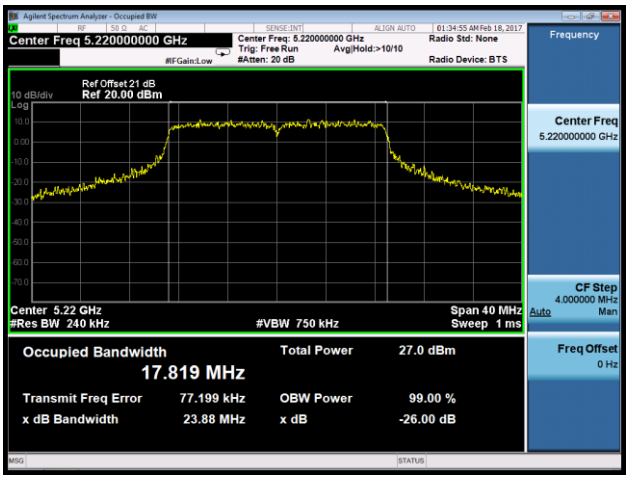
Channel 118 (5590MHz)	Channel 134 (5670MHz)
	
Channel 151 (5755MHz)	**Channel 159 (5795MHz)**
	

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

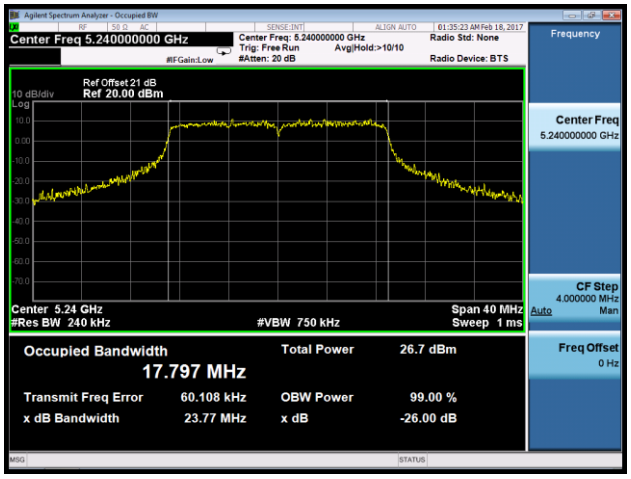
Channel 36 (5180MHz)



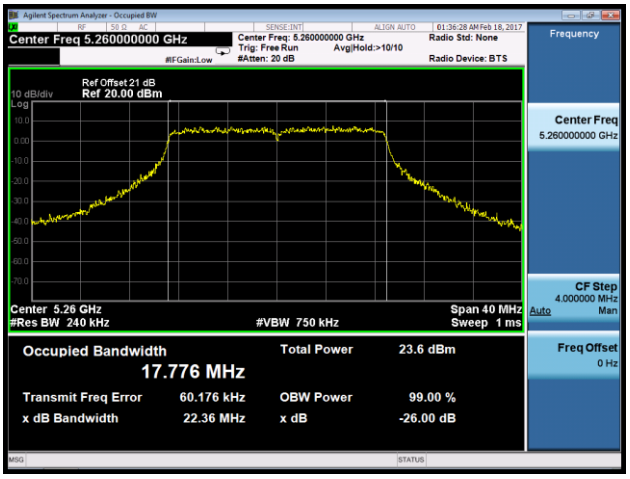
Channel 44 (5220MHz)



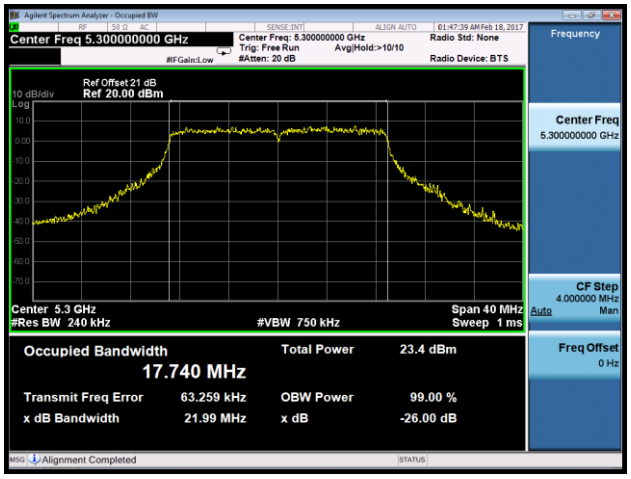
Channel 48 (5240MHz)



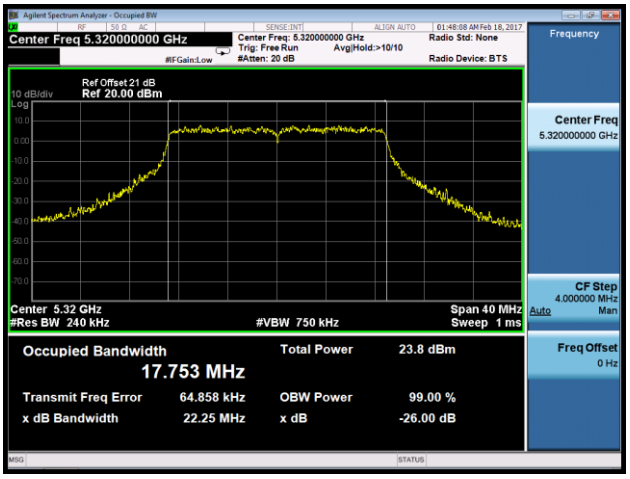
Channel 52 (5260MHz)

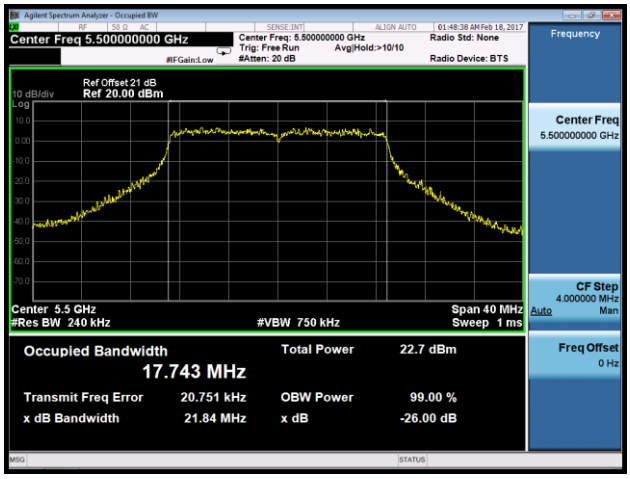
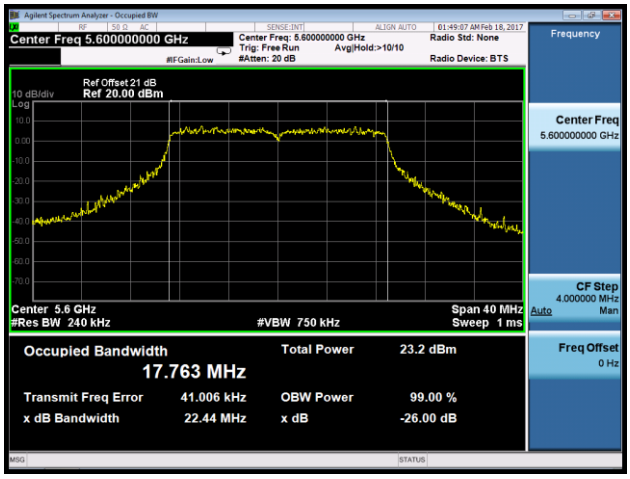
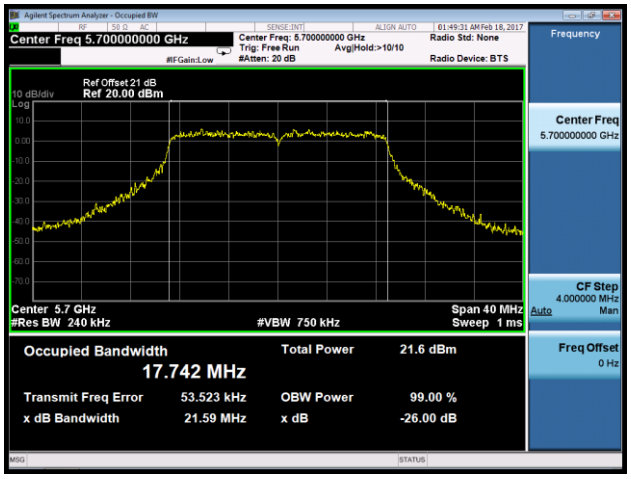
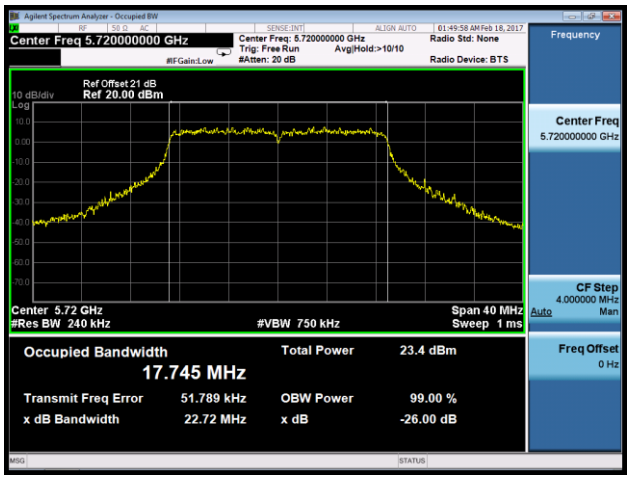
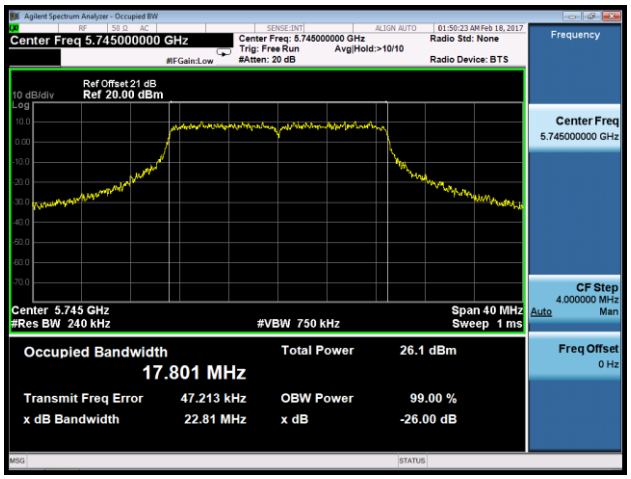


Channel 60 (5300MHz)



Channel 64 (5320MHz)



Channel 100 (5500MHz)	Channel 116 (5580MHz)
	
Channel 120 (5600MHz)	**Channel 140 (5700MHz)**
	
Channel 144 (5720MHz)	**Channel 149 (5745MHz)**
	

Channel 157 (5785MHz)	Channel 165 (5825MHz)