# MEASUREMENT REPORT

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

| | |
|---|---|
| **FCC ID:** | 2AD8UFZCWM2B1 |
| **APPLICANT:** | Nokia Solutions and Networks, OY |
| **Application Type:** | Certification |
| **Product:** | AC220m Wi-Fi module ID US |
| **Model No.:** | WM2B-AC220m |
| **Brand Name:** | Nokia |
| **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 Procedure(s):** | ANSI C63.10-2013 |
| **Test Date:** | November 12, 2017 ~ February 27, 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.

# Revision History

| Report No. | Version | Description | Issue Date | Note |
|---|---|---|---|---|
| 1712TW0105-U4 | Rev. 01 | Initial Report | 02-22-2018 | Invalid |
| 1712TW0105-U4 | Rev. 02 | Added some bandedge test result | 02-28-2018 | Valid |

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Description Page

## §2.1033General Information

| | |
|---|---|
| **Applicant:** | Nokia Solutions and Networks, OY |
| **Applicant Address:** | 2000 W. Lucent Lane, Naperville, Illinois, United States, 60563 |
| **Manufacturer:** | Nokia Solutions and Networks, OY |
| **Manufacturer Address:** | 2000 W. Lucent Lane, Naperville, Illinois, United States, 60563 |
| **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.:** | N/A ☐ Production ☒ Pre-Production ☐ Engineering |

**Test Facility / Accreditations**

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

- **MRT facility is a FCC registered (Reg. No. 153292) 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.**

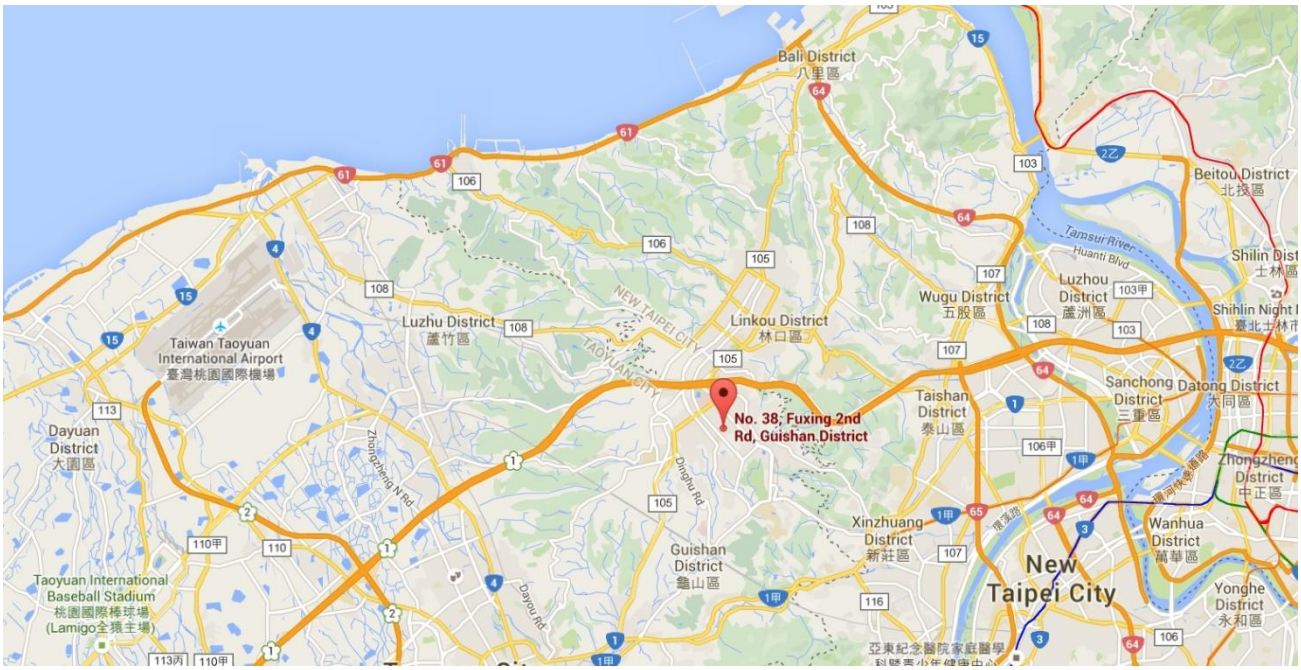
# 1. INTRODUCTION

## 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 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 | AC220m Wi-Fi module ID US |
| Model No. | WM2B-AC220m |
| Brand Name: | NOKIA |
| Wi-Fi Specification: | 802.11a/b/g/n/ac |
| Frequency Range | **2.4GHz:**<br>For 802.11b/g/n-HT20: 2412 ~ 2462 MHz<br>For 802.11n-HT40: 2422 ~ 2452 MHz<br>**5GHz:**<br>For 802.11a/n-HT20/ac-VHT20:5180~5320MHz, 5500~5720MHz, 5745~5825MHz<br>For 802.11n-HT40/ac-VHT40:5190~5310MHz, 5510~5710MHz, 5755~5795MHz<br>For 802.11ac-VHT80:5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz |
| Maximum Output Power | **SISO Mode:**<br>802.11a: 22.07dBm, 802.11n-HT20: 22.06dBm,<br>802.11n-HT40: 23.81dBm, 802.11ac-VHT20: 22.44dBm,<br>802.11ac-VHT40: 23.65dBm, 802.11ac-VHT80: 23.67dBm<br>**CDD Mode:**<br>802.11a: 19.79dBm, 802.11n-HT20: 19.65dBm,<br>802.11n-HT40: 22.03dBm, 802.11ac-VHT20: 19.33dBm,<br>802.11ac-VHT40: 22.02dBm, 802.11ac-VHT80: 23.71dBm<br>**Beam-Forming Mode:**<br>802.11n-HT20: 19.65dBm, 802.11n-HT40: 21.19dBm,<br>802.11ac-VHT20: 19.33dBm, 802.11ac-VHT40: 21.20dBm,<br>802.11ac-VHT80: 20.97dBm |
| Type of Modulation | 802.11b: DSSS, 802.11a/g/n/ac: OFDM |
| Modulation Type | CCK, DQPSK, DBPSK for DSSS<br>16QAM, 64QAM, 256QAM, QPSK, BPSK for OFDM |

## 2.2. Working Frequencies for this report

802.11a/n-HT20/ac-VHT20

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 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 | -- | -- | -- | -- |

802.11n-HT40/ac-VHT40

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 54 | 5270 MHz | 62 | 5310 MHz | 102 | 5510 MHz |
| 110 | 5550 MHz | 118 | 5590 MHz | 126 | 5630 MHz |
| 134 | 5670 MHz | 142 | 5710 MHz | -- | -- |

802.11ac-VHT80

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 58 | 5290 MHz | 106 | 5530 MHz | 122 | 5610 MHz |
| 138 | 5690 MHz | -- | -- | -- | -- |

## 2.3. Description of Available Antenna

| Antenna Port | Brand | Connector Type | Cable Length | Antenna Type | Frequency (MHz) | Gain (dBi) |
|---|---|---|---|---|---|---|
| Ant 0 | Galtronics | MMCX | 9.1cm | PIFA | 5250 ~ 5350 | 4.91 |
| | | | | | 5470 ~ 5725 | 5.23 |
| Ant 1 | | MMCX | 30.6cm | PIFA | 5250 ~ 5350 | 6.17 |
| | | | | | 5470 ~ 5725 | 5.57 |

| Frequency Band (MHz) | Tx Paths | Per Chain Max Antenna Gain (dBi) | | Beam Forming Directional Gain (dBi) | | CDD Directional Gain (dBi) | |
|---|---|---|---|---|---|---|---|
| | | Ant 0 | Ant 1 | For Power | For PSD | For Power | For PSD |
| 5250 ~ 5350 | 2 | 4.91 | 6.17 | 8.57 | 8.57 | 6.17 | 9.18 |
| 5470 ~ 5725 | 2 | 5.23 | 5.57 | 8.41 | 8.41 | 5.57 | 8.58 |

Note1: The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g mode, and CDD signals are correlated.

Note 2: The EUT supports Beam Forming technology for 802.11n/ac mode.

Note 3: For CDD transmissions, directional gain is calculated as follows, $N_{ANT}$ = 2, $N_{SS}$ = 1.

Two 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 4: For Beam Forming transmissions, directional gain = 10*log[($10^{G1/20}$ + $10^{G2/20}$ + … + $10^{GN/20}$)$^2$/$N_{ANT}$]dBi.

## 2.4. Description of Antenna RF Port

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

## 2.5. Test Mode

| | |
|---|---|
| Test Mode | Mode 1: Transmit by 802.11a (6Mbps) |
| | Mode 2: Transmit by 802.11n-HT20 (MSC0) |
| | Mode 3: Transmit by 802.11n-HT40 (MSC0) |
| | Mode 4: Transmit by 802.11ac-VHT20 (MSC0) |
| | Mode 5: Transmit by 802.11ac-VHT40 (MSC0) |
| | Mode 6: Transmit by 802.11ac-VHT80 (MSC0) |

| 5GHz Test Mode | Ant 0 + 1 | |
|---|---|---|
| | CDD | Beam-Forming |
| 802.11a | √ | × |
| 802.11n-HT20 | √ | √ |
| 802.11n-HT40 | √ | √ |
| 802.11ac-VHT20 | √ | √ |
| 802.11ac-VHT40 | √ | √ |
| 802.11ac-VHT80 | √ | √ |

## 2.6. Description of Test Software

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

## 2.7. Device Capabilities

This device contains the following capabilities:
2.4GHz WLAN (DTS) and 5GHzWLAN (NII)
Note: 5GHz (NII) operation is possible in 20MHz, 40MHzand 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 ANSI C63.10-2013. 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 | 96.04 % |
| 802.11n-HT20 | 98.23 % |
| 802.11n-HT40 | 96.61 % |
| 802.11ac-VHT20 | 98.23 % |
| 802.11ac-VHT40 | 96.62 % |
| 802.11ac-VHT80 | 93.79 % |

## 2.8. Test Configuration

The device 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 pamphlet supplied 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 and label 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.

**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.”

- The antenna of the Radio Controller is **permanently attached.**
- There are no provisions for connection to an external antenna.

**Conclusion:**

The 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 | 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 |
| 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** |
|---|---|---|
| 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.

| Conducted Emission Measurement - SR2 |
| --- |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>150kHz~30MHz: 3.46dB |
| **Radiated Emission Measurement - AC1** |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>9kHz ~ 1GHz: 4.18dB<br>1GHz ~ 25GHz: 4.76dB |

# 7. TEST RESULT

## 7.1. Summary

**Product Name:** **AC220m Wi-Fi module ID US**

**FCC ID:** **2AD8UFZCWM2B1**

**Data Rate / MCS Tested:** **6Mbps ~ 54Mbps (a); MCS0 for 802.11n-HT20MHz; MCS0 for 802.11n-HT40MHz; MCS0 for 802.11ac-VHT20MHz; MCS0 for 802.11ac-VHT40MHz; MCS0 for 802.11ac-VHT80MHz**

| 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(e) | 6dB Bandwidth | ≥ 500kHz | | Pass | Section 7.3 |
| 15.407(a)(1)(ii), (2), (3) | Maximum Conducted Output Power | Refer to Section 7.4 | | Pass | Section 7.4 |
| 15.407(h)(1) | Transmit Power Control | ≤ 24 dBm | | N/A | Section 7.5 |
| 15.407(a)(1)(ii), (2), (3), (5) | Peak Power Spectral Density | Refer to Section 7.6 | | Pass | Section 7.6 |
| 15.407(g) | Frequency Stability | N/A | | Pass | Section 7.7 |
| 15.407(b)(1), (2), (3), (4) | Undesirable Emissions | Refer to Section 7.8 & 7.9 | Radiated | Pass | Section 7.8 & 7.9 |
| 15.205, 15.209 15.407(b)(5), (6), (7) | General Field Strength Limits(Restricted Bands andRadiated Emission Limits) | Emissions in restrictedbands must meet theradiated limits detailed in15.209 | | Pass | |
| 15.207 | AC Conducted Emissions 150kHz - 30MHz | < FCC 15.207 limits | Line Conducted | Pass | Section 7.10 |

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer.The correction table was used to account for the losses of the cables and attenuators used as part 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 single and MIMO transmission, and showed the worst test data in this report.

## 7.2. 26dB Bandwidth Measurement

### 7.2.1.Test Limit

N/A

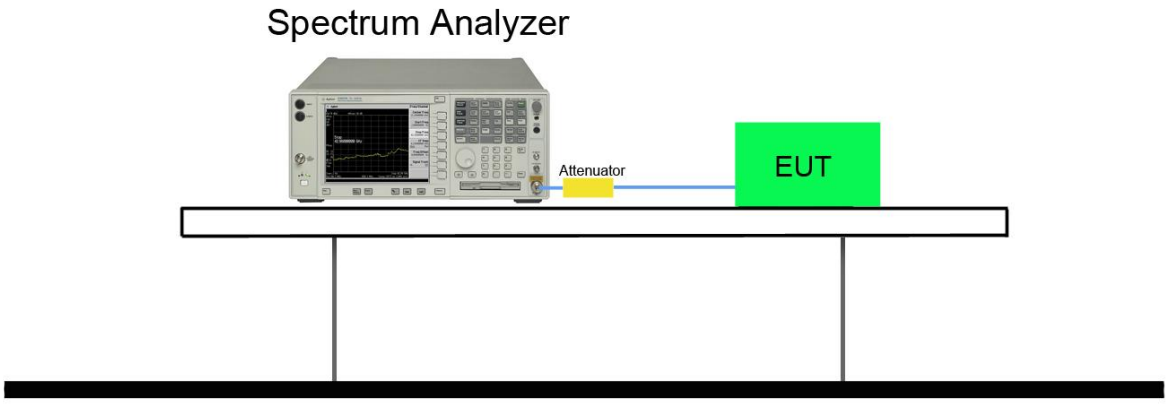
### 7.2.2.Test Procedure used

KDB 789033 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

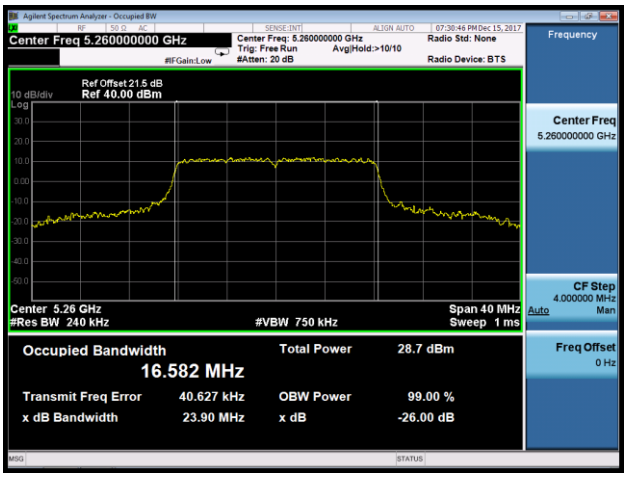
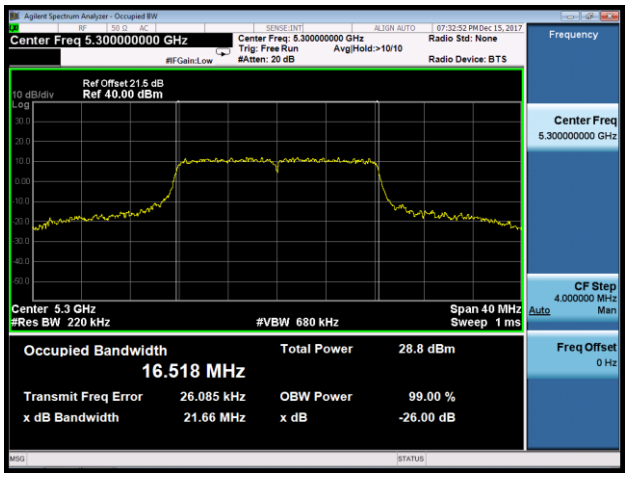
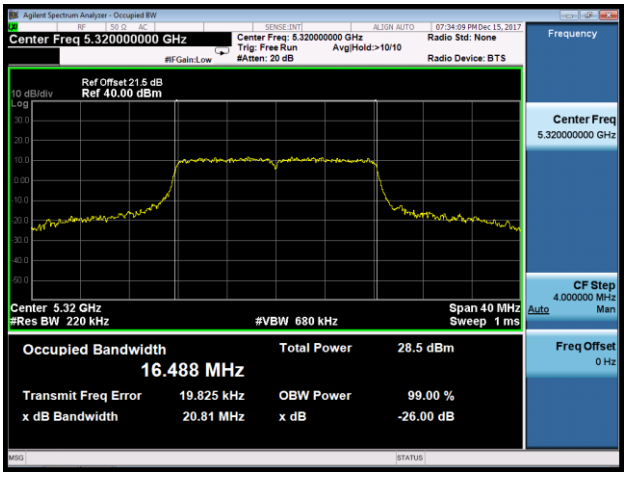
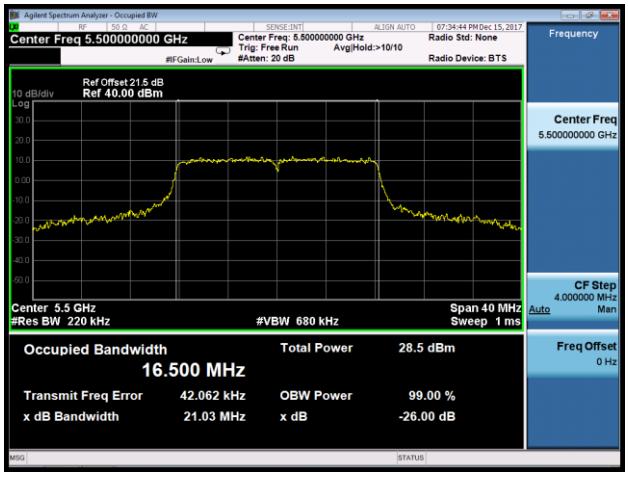
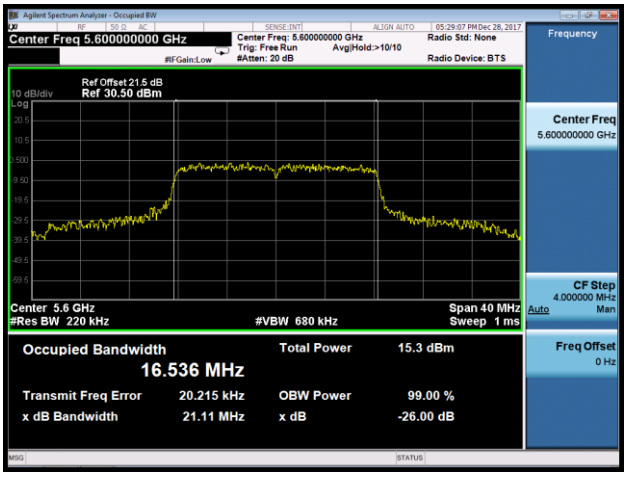
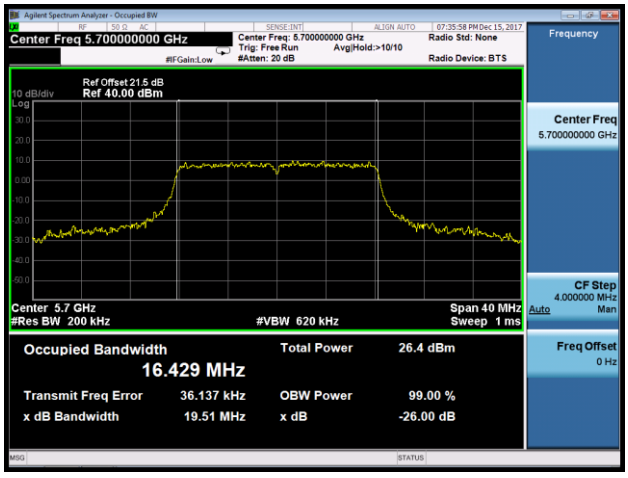
| Product | AC220m Wi-Fi module ID US | Temperature | 24°C |
|---|---|---|---|
| Test Engineer | Peter Xu | Relative Humidity | 59% |
| Test Site | SR2 | Test Date | 2017/12/13 |

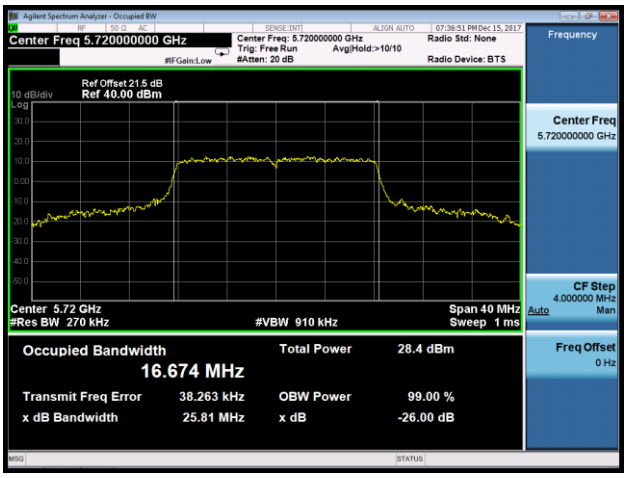
| Test Mode | Data Rate/ MCS | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|---|---|
| Ant 0 | | | | | |
| 802.11a | 6Mbps | 52 | 5260 | 23.90 | 16.58 |
| 802.11a | 6Mbps | 60 | 5300 | 21.66 | 16.52 |
| 802.11a | 6Mbps | 64 | 5320 | 20.81 | 16.49 |
| 802.11a | 6Mbps | 100 | 5500 | 21.03 | 16.50 |
| 802.11a | 6Mbps | 120 | 5600 | 21.11 | 16.54 |
| 802.11a | 6Mbps | 140 | 5700 | 19.51 | 16.43 |
| 802.11a | 6Mbps | 144 | 5720 | 25.81 | 16.67 |
| 802.11n-HT20 | MCS0 | 52 | 5260 | 23.02 | 17.70 |
| 802.11n-HT20 | MCS0 | 60 | 5300 | 22.59 | 17.66 |
| 802.11n-HT20 | MCS0 | 64 | 5320 | 21.00 | 17.65 |
| 802.11n-HT20 | MCS0 | 100 | 5500 | 20.67 | 17.66 |
| 802.11n-HT20 | MCS0 | 120 | 5600 | 26.51 | 17.75 |
| 802.11n-HT20 | MCS0 | 140 | 5700 | 20.24 | 17.61 |
| 802.11n-HT20 | MCS0 | 144 | 5720 | 28.21 | 17.77 |
| 802.11n-HT40 | MCS0 | 54 | 5270 | 72.24 | 36.87 |
| 802.11n-HT40 | MCS0 | 62 | 5310 | 39.66 | 35.93 |
| 802.11n-HT40 | MCS0 | 102 | 5510 | 39.12 | 35.90 |
| 802.11n-HT40 | MCS0 | 110 | 5590 | 77.92 | 40.58 |
| 802.11n-HT40 | MCS0 | 134 | 5670 | 54.98 | 36.21 |
| 802.11n-HT40 | MCS0 | 142 | 5710 | 79.22 | 37.63 |

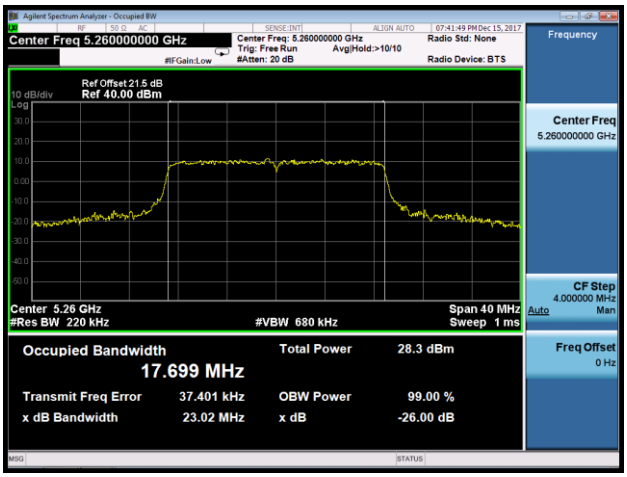
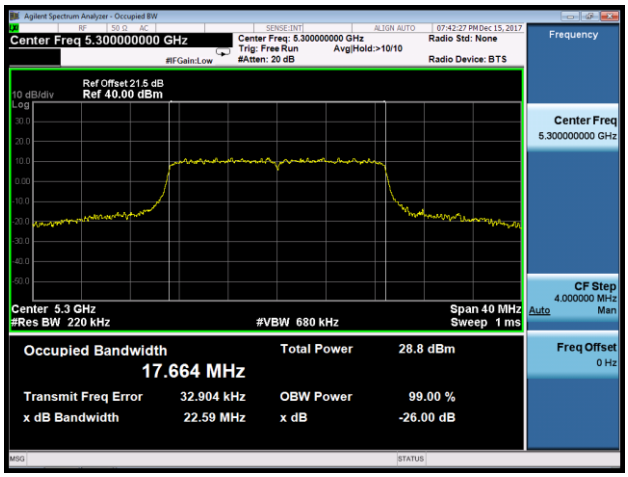
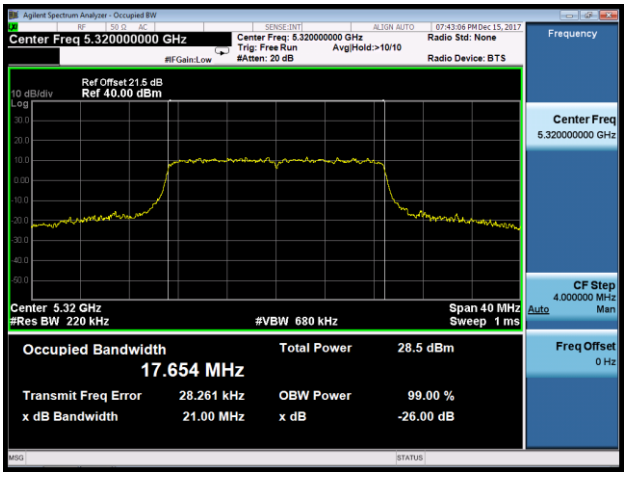
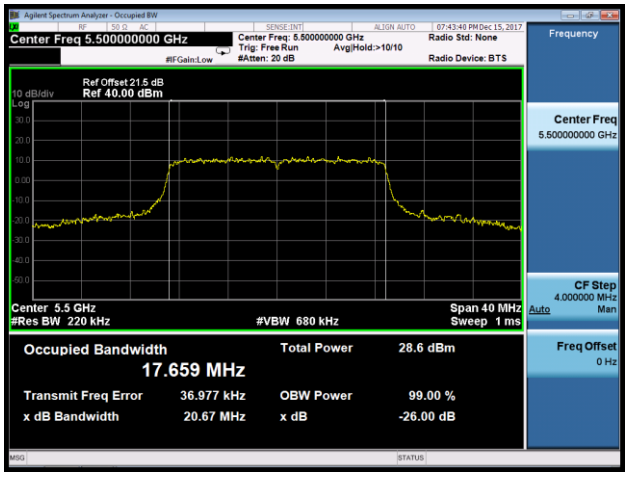
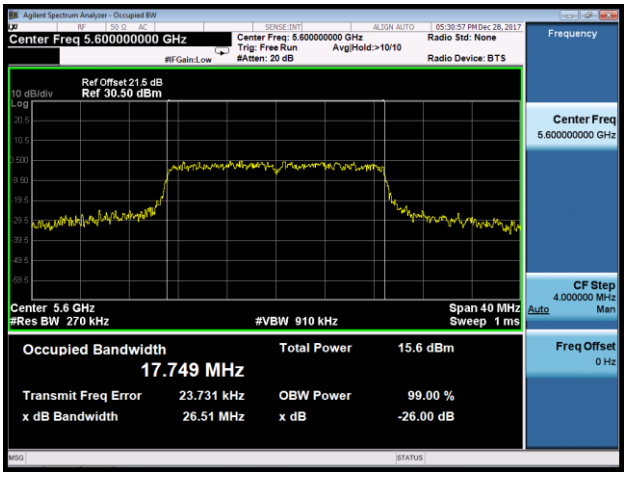
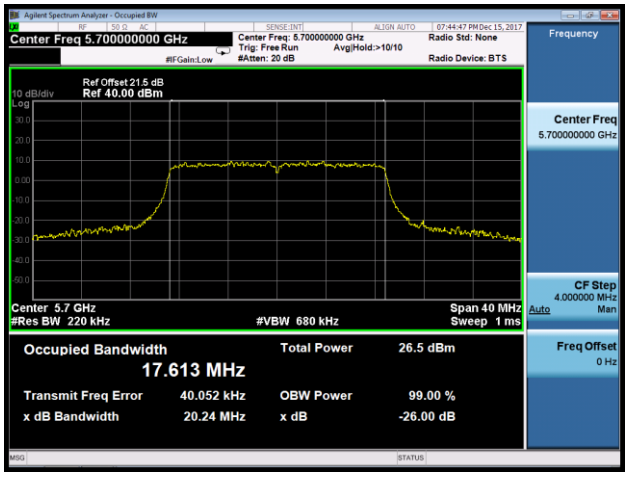
| Test Mode | Data Rate/ MCS | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|---|---|
| Ant 0 | | | | | |
| 802.11ac-VHT20 | MCS0 | 52 | 5260 | 22.39 | 17.68 |
| 802.11ac-VHT20 | MCS0 | 60 | 5300 | 22.29 | 17.67 |
| 802.11ac-VHT20 | MCS0 | 64 | 5320 | 20.91 | 17.65 |
| 802.11ac-VHT20 | MCS0 | 100 | 5500 | 20.98 | 17.66 |
| 802.11ac-VHT20 | MCS0 | 120 | 5600 | 26.35 | 17.74 |
| 802.11ac-VHT20 | MCS0 | 140 | 5700 | 20.40 | 17.63 |
| 802.11ac-VHT20 | MCS0 | 144 | 5720 | 27.93 | 17.73 |
| 802.11ac-VHT40 | MCS0 | 54 | 5270 | 72.28 | 36.73 |
| 802.11ac-VHT40 | MCS0 | 62 | 5310 | 39.38 | 35.93 |
| 802.11ac-VHT40 | MCS0 | 102 | 5510 | 39.41 | 35.95 |
| 802.11ac-VHT40 | MCS0 | 118 | 5590 | 77.80 | 40.57 |
| 802.11ac-VHT40 | MCS0 | 134 | 5670 | 78.90 | 40.37 |
| 802.11ac-VHT40 | MCS0 | 142 | 5710 | 78.75 | 37.70 |
| 802.11ac-VHT80 | MCS0 | 58 | 5290 | 82.75 | 75.79 |
| 802.11ac-VHT80 | MCS0 | 106 | 5530 | 82.88 | 75.74 |
| 802.11ac-VHT80 | MCS0 | 122 | 5610 | 159.90 | 81.67 |
| 802.11ac-VHT80 | MCS0 | 138 | 5690 | 160.00 | 80.22 |

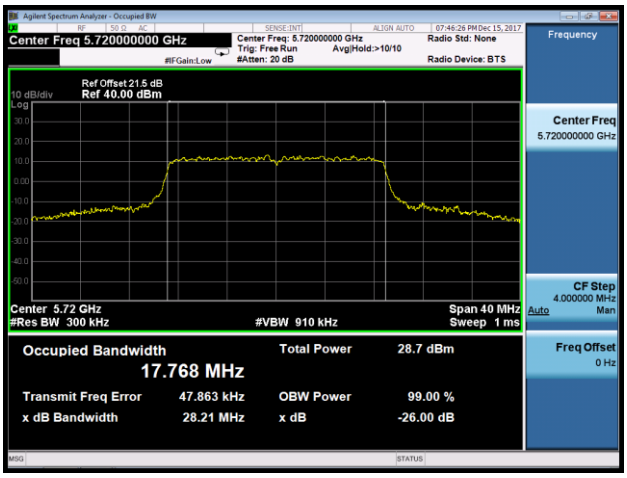
| Test Mode | Data Rate/ MCS | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|---|---|
| Ant 1 | | | | | |
| 802.11a | 6Mbps | 52 | 5260 | 20.40 | 16.45 |
| 802.11a | 6Mbps | 60 | 5300 | 20.54 | 16.44 |
| 802.11a | 6Mbps | 64 | 5320 | 19.42 | 16.41 |
| 802.11a | 6Mbps | 100 | 5500 | 20.48 | 16.44 |
| 802.11a | 6Mbps | 120 | 5600 | 19.16 | 16.41 |
| 802.11a | 6Mbps | 140 | 5700 | 19.03 | 16.41 |
| 802.11a | 6Mbps | 144 | 5720 | 19.56 | 16.46 |
| 802.11n-HT20 | MCS0 | 52 | 5260 | 20.36 | 17.64 |
| 802.11n-HT20 | MCS0 | 60 | 5300 | 20.19 | 17.62 |
| 802.11n-HT20 | MCS0 | 64 | 5320 | 20.18 | 17.63 |
| 802.11n-HT20 | MCS0 | 100 | 5500 | 20.13 | 17.62 |
| 802.11n-HT20 | MCS0 | 120 | 5600 | 19.91 | 17.60 |
| 802.11n-HT20 | MCS0 | 140 | 5700 | 19.90 | 17.58 |
| 802.11n-HT20 | MCS0 | 144 | 5720 | 20.04 | 17.61 |
| 802.11n-HT40 | MCS0 | 54 | 5270 | 71.68 | 36.45 |
| 802.11n-HT40 | MCS0 | 62 | 5310 | 39.26 | 35.94 |
| 802.11n-HT40 | MCS0 | 102 | 5510 | 39.42 | 35.86 |
| 802.11n-HT40 | MCS0 | 110 | 5590 | 38.97 | 35.90 |
| 802.11n-HT40 | MCS0 | 134 | 5670 | 39.24 | 35.93 |
| 802.11n-HT40 | MCS0 | 142 | 5710 | 68.49 | 36.36 |

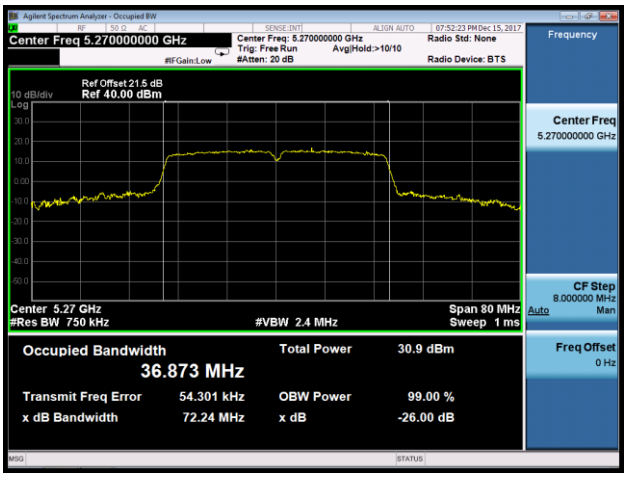
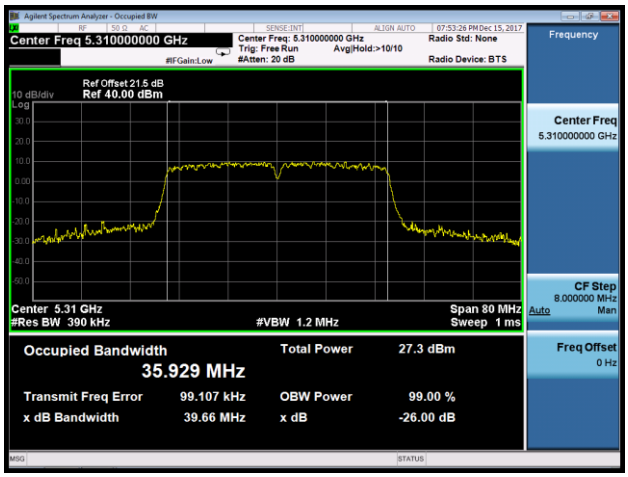
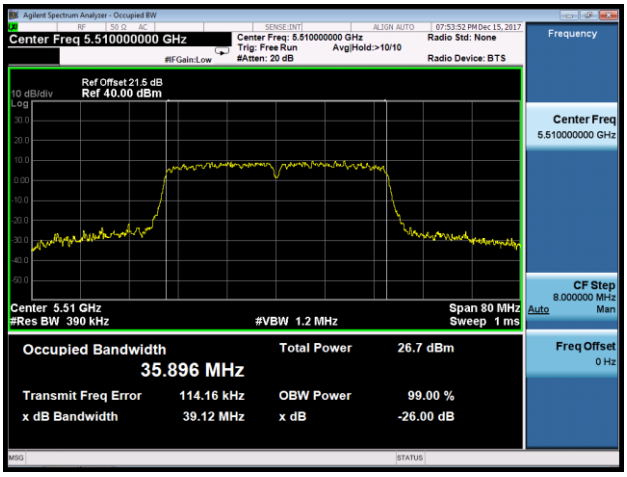
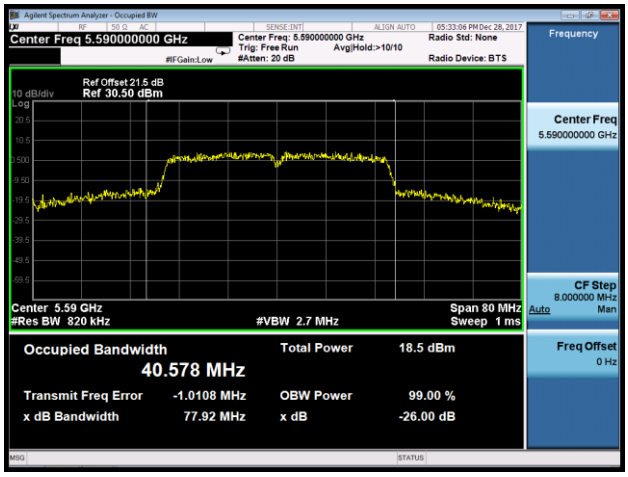
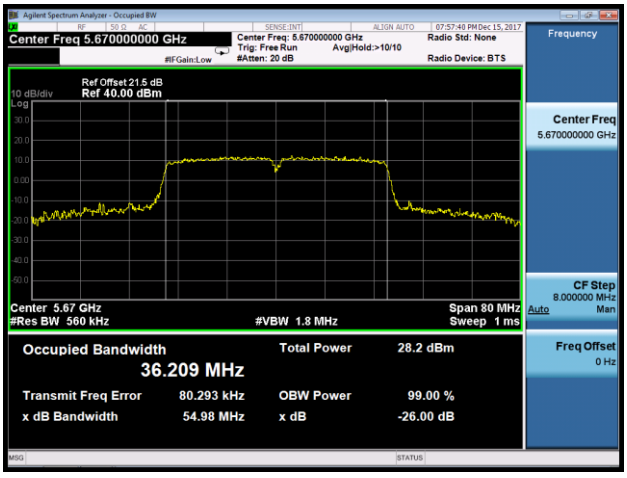
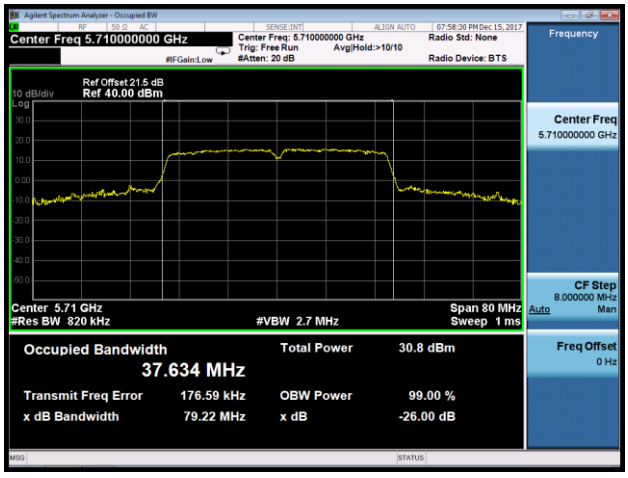
| Test Mode | Data Rate/ MCS | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|---|---|
| Ant 1 | | | | | |
| 802.11ac-VHT20 | MCS0 | 52 | 5260 | 21.11 | 17.65 |
| 802.11ac-VHT20 | MCS0 | 60 | 5300 | 22.34 | 17.65 |
| 802.11ac-VHT20 | MCS0 | 64 | 5320 | 20.32 | 17.64 |
| 802.11ac-VHT20 | MCS0 | 100 | 5500 | 20.35 | 17.62 |
| 802.11ac-VHT20 | MCS0 | 120 | 5600 | 19.97 | 17.60 |
| 802.11ac-VHT20 | MCS0 | 140 | 5700 | 20.04 | 17.60 |
| 802.11ac-VHT20 | MCS0 | 144 | 5720 | 20.08 | 17.62 |
| 802.11ac-VHT40 | MCS0 | 54 | 5270 | 72.41 | 36.48 |
| 802.11ac-VHT40 | MCS0 | 62 | 5310 | 39.57 | 35.92 |
| 802.11ac-VHT40 | MCS0 | 102 | 5510 | 39.24 | 35.87 |
| 802.11ac-VHT40 | MCS0 | 118 | 5590 | 38.93 | 35.90 |
| 802.11ac-VHT40 | MCS0 | 134 | 5670 | 48.74 | 36.05 |
| 802.11ac-VHT40 | MCS0 | 142 | 5710 | 67.56 | 36.34 |
| 802.11ac-VHT80 | MCS0 | 58 | 5290 | 82.96 | 75.75 |
| 802.11ac-VHT80 | MCS0 | 106 | 5530 | 82.93 | 75.74 |
| 802.11ac-VHT80 | MCS0 | 122 | 5610 | 120.10 | 76.58 |
| 802.11ac-VHT80 | MCS0 | 138 | 5690 | 129.70 | 76.26 |

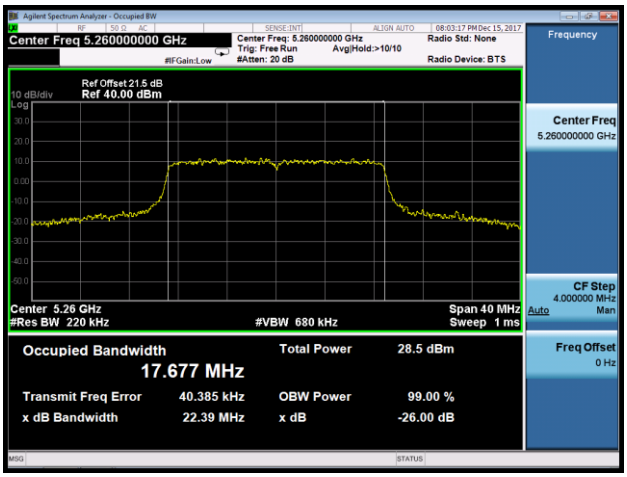
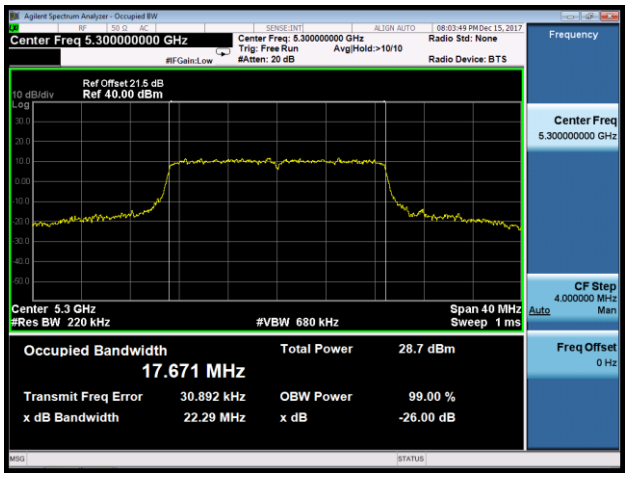
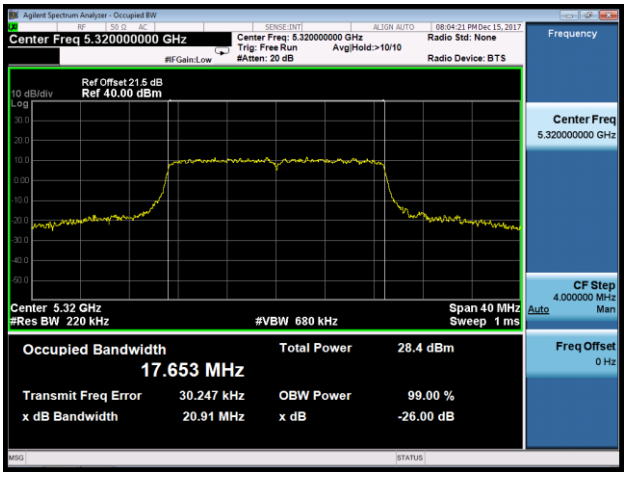
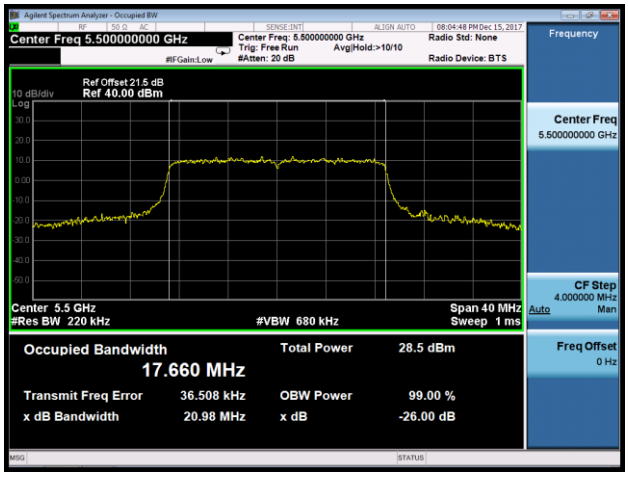
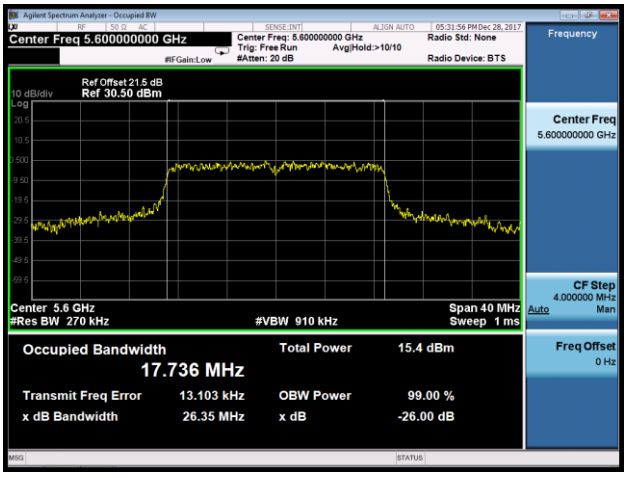
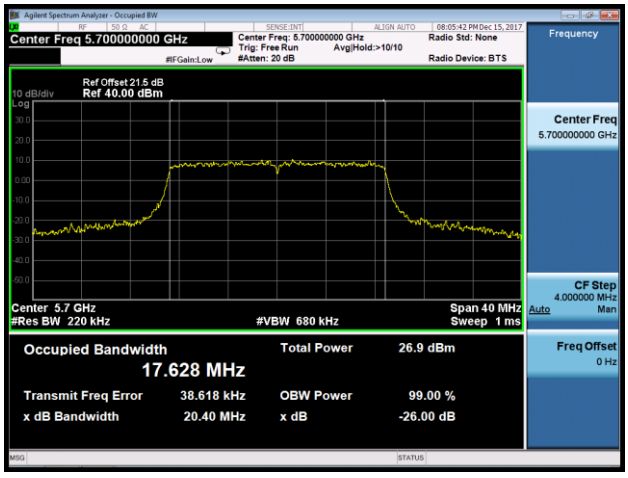
| 802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0 | |
|---|---|
| Channel 52 (5260MHz) | Channel 60 (5300MHz) |
|  |  |
| Channel 64 (5320MHz) | Channel 100 (5500MHz) |
|  |  |
| Channel 120 (5600MHz) | Channel 140 (5700MHz) |
|  |  |

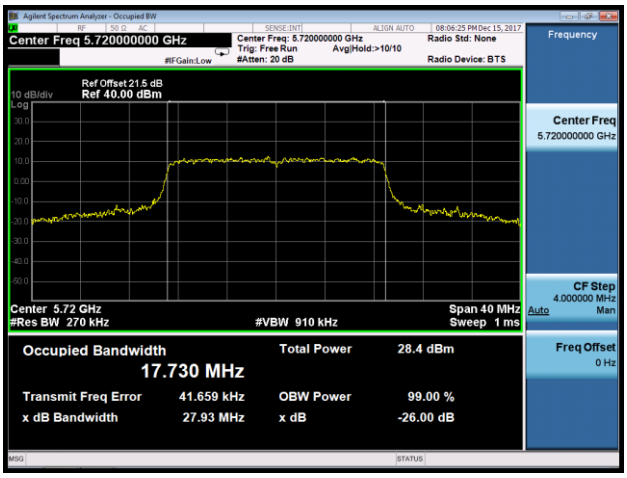
| Channel 144 (5720MHz) | |
|---|---|
|  | |

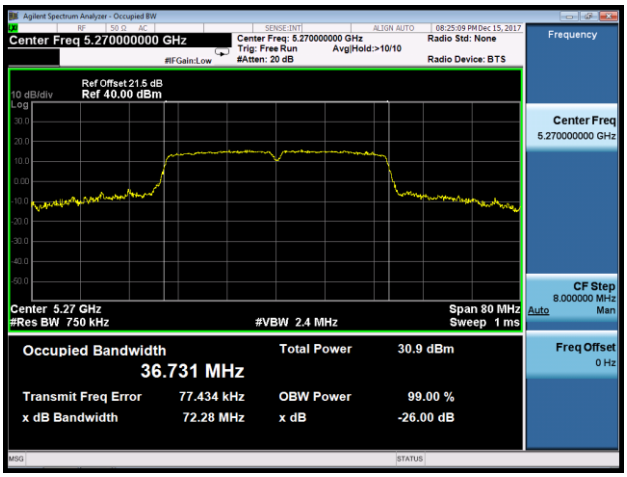
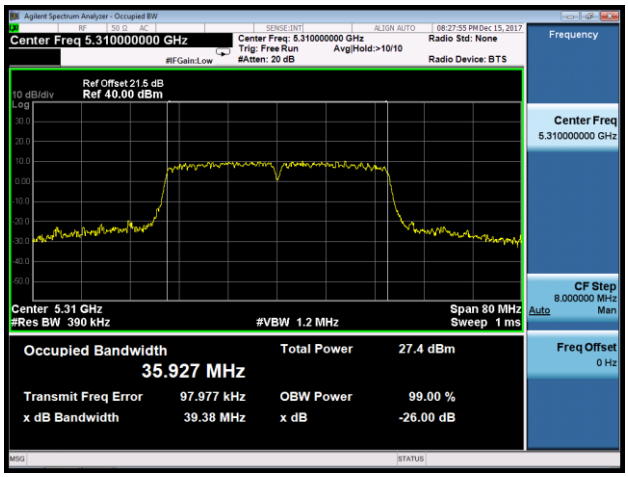
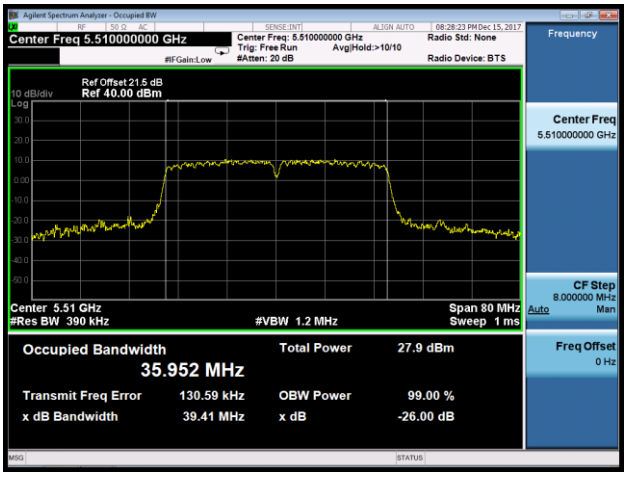
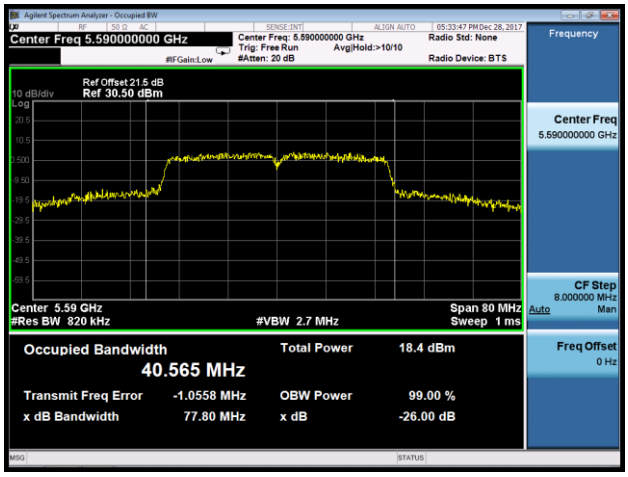
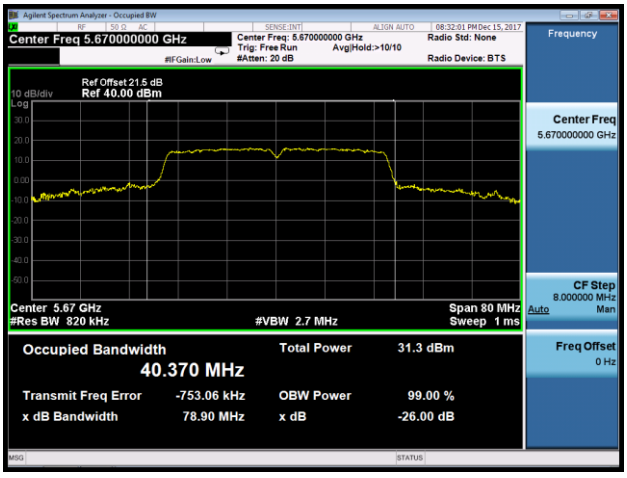
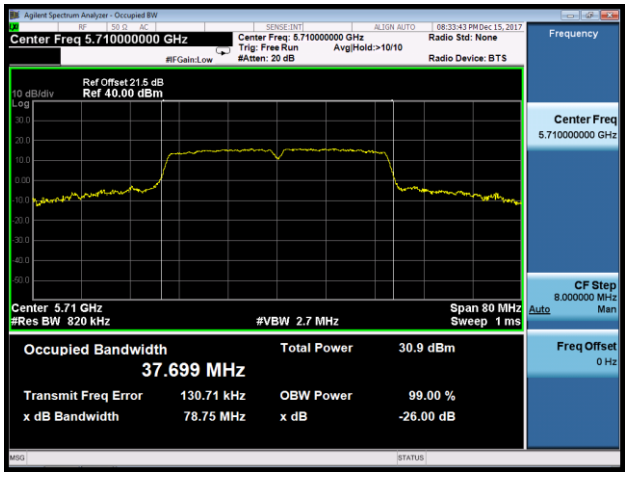
| 802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 | |
|---|---|
| Channel 52 (5260MHz) | Channel 60 (5300MHz) |
|  |  |
| Channel 64 (5320MHz) | Channel 100 (5500MHz) |
|  |  |
| Channel 120 (5600MHz) | Channel 140 (5700MHz) |
|  |  |

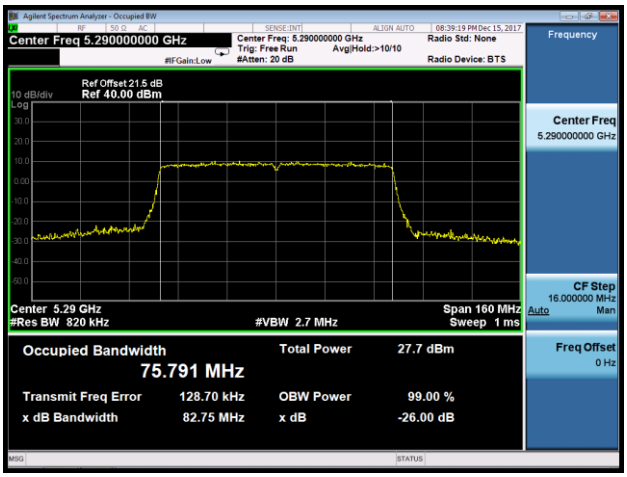
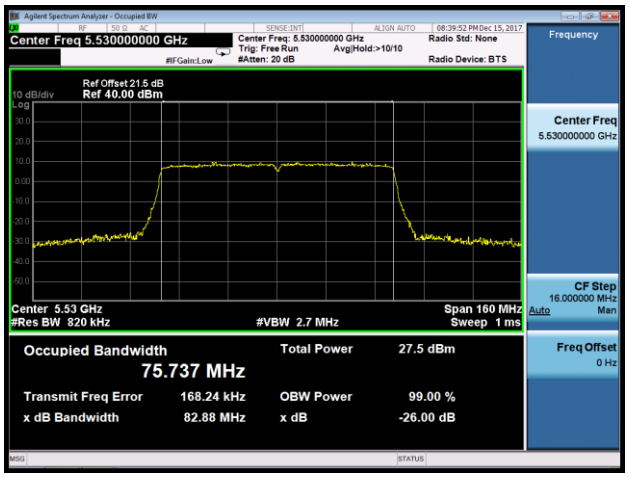
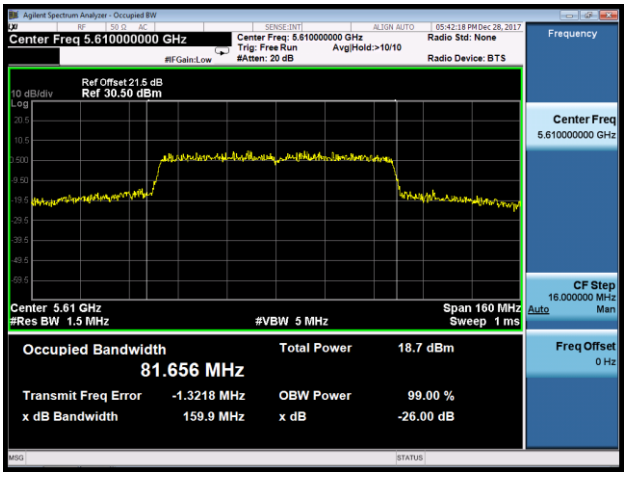
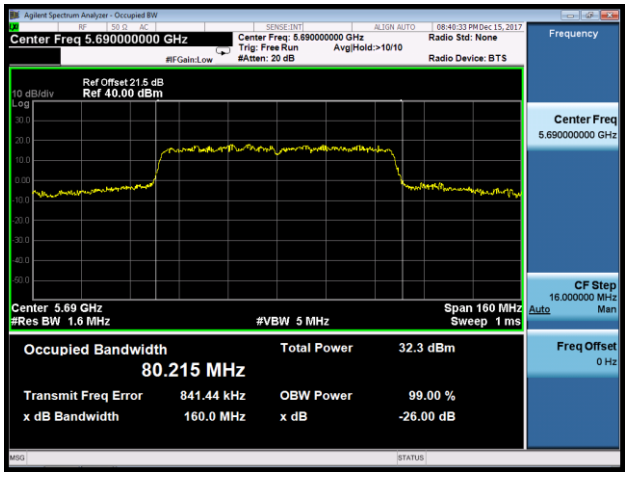
| Channel 144 (5720MHz) | |
|---|---|
|  | |

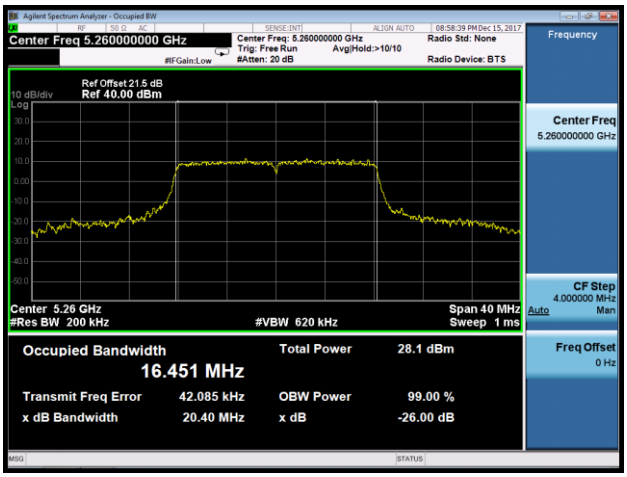
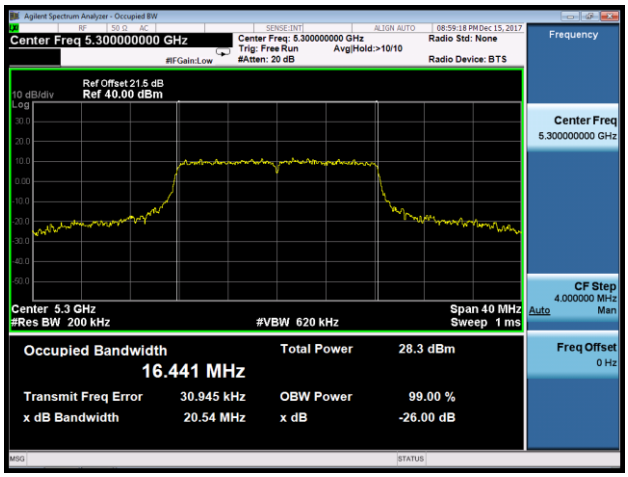
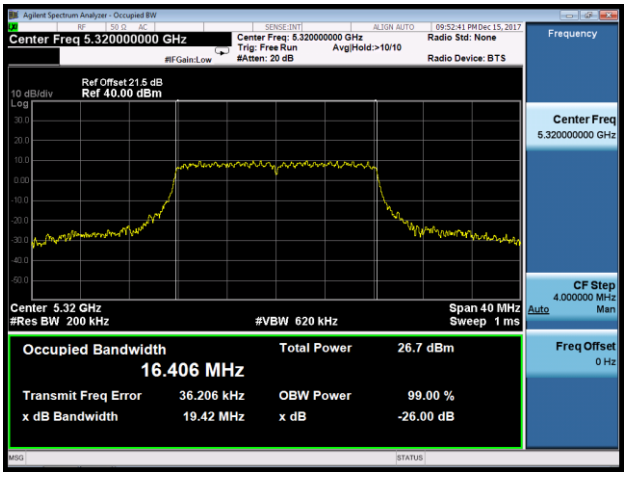
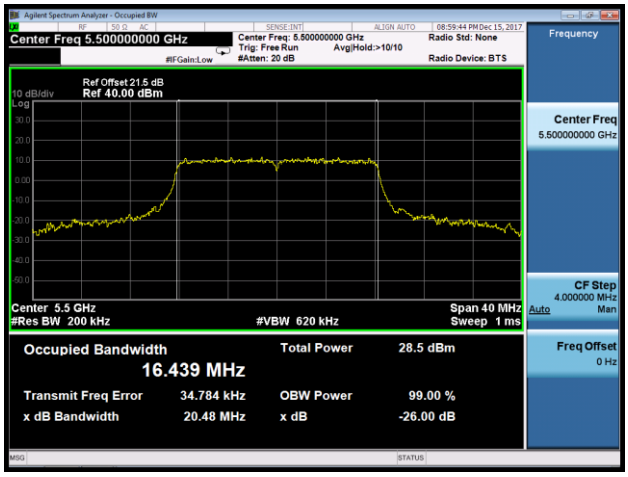
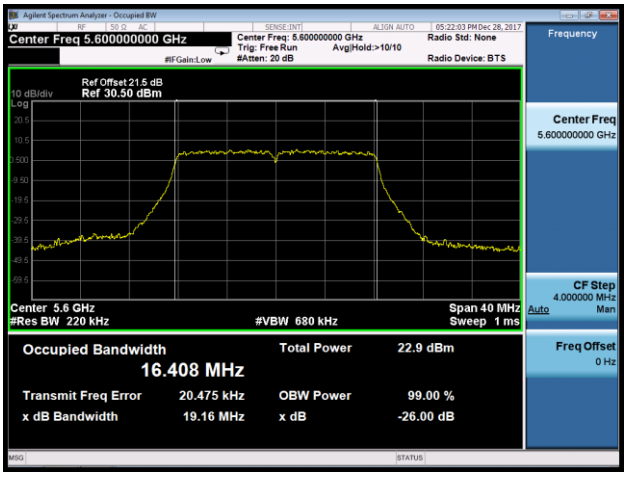
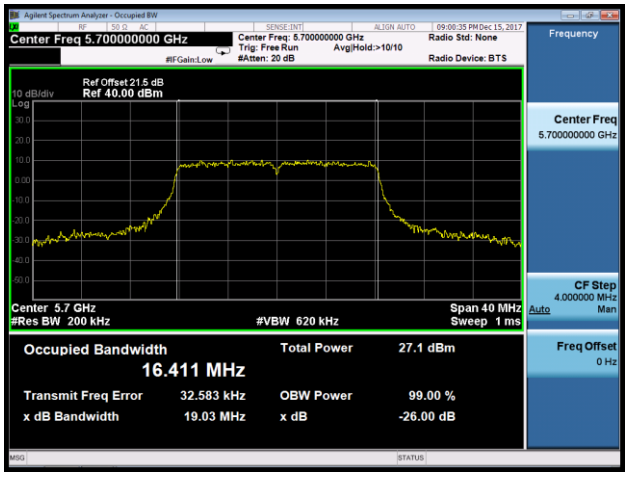
| 802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 0 | |
|---|---|
| Channel 54 (5270MHz) | Channel 62 (5310MHz) |
|  |  |
| Channel 102 (5510MHz) | Channel 118 (5590MHz) |
|  |  |
| Channel 134 (5670MHz) | Channel 142 (5710MHz) |
|  |  |

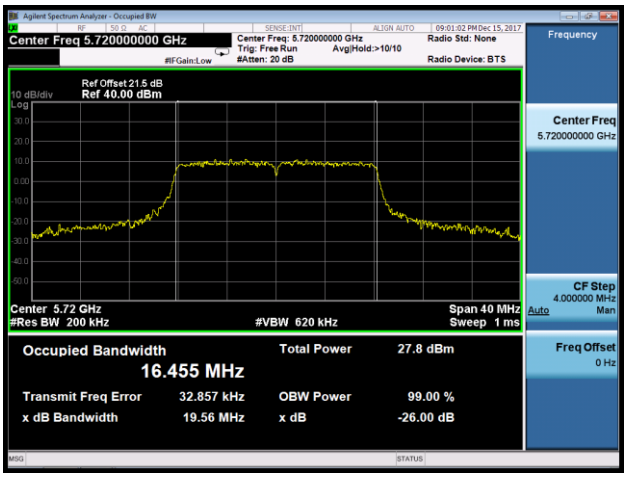
| 802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 0 | |
|---|---|
| Channel 52 (5260MHz) | Channel 60 (5300MHz) |
|  |  |
| Channel 64 (5320MHz) | Channel 100 (5500MHz) |
|  |  |
| Channel 120 (5600MHz) | Channel 140 (5700MHz) |
|  |  |

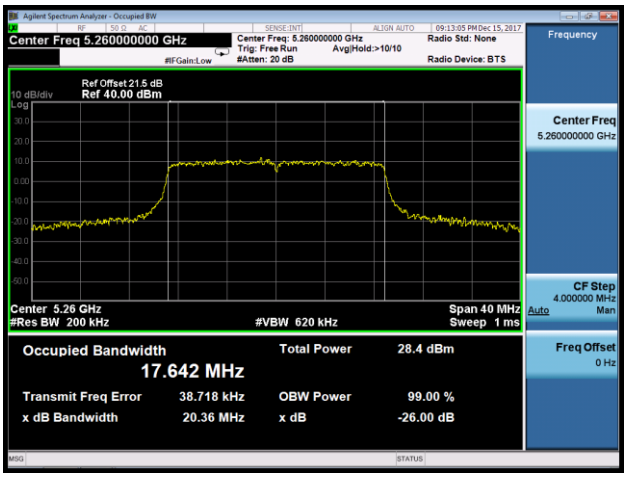
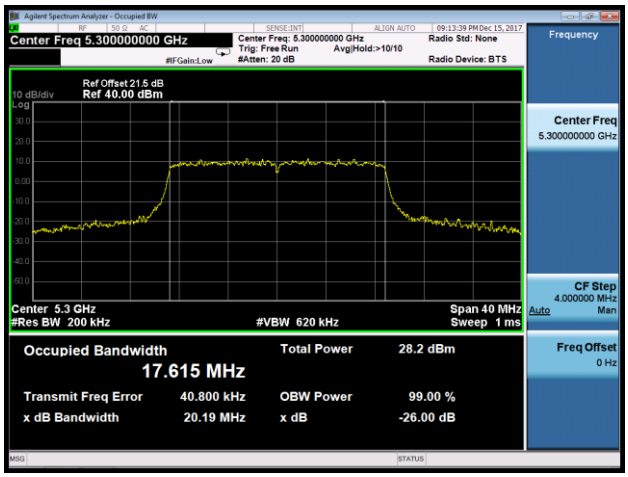
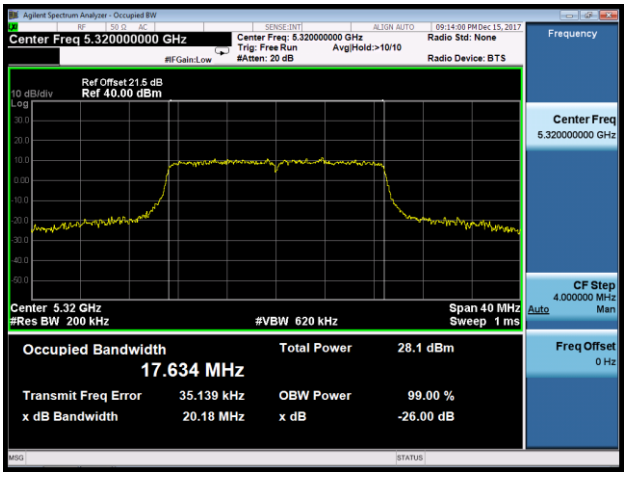
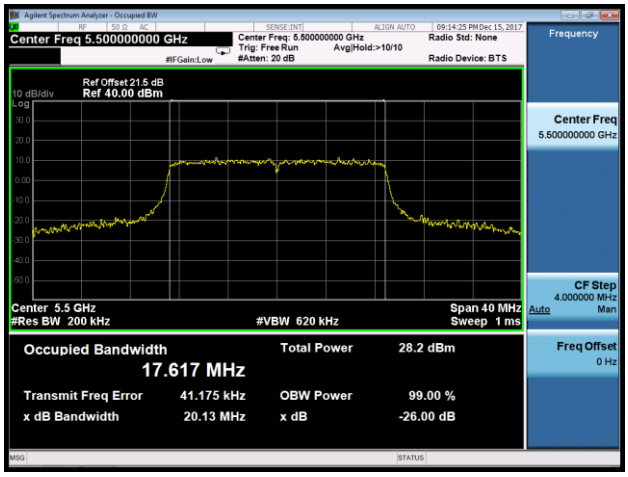
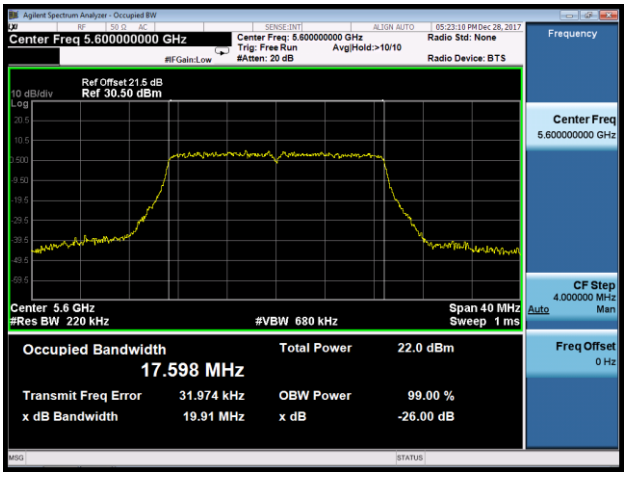
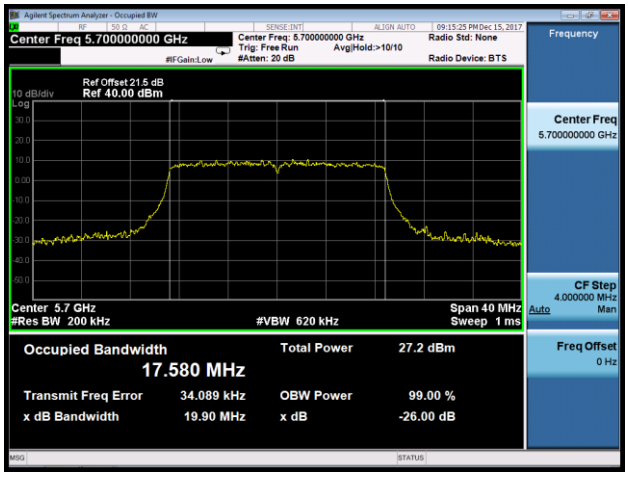
| Channel 144 (5720MHz) | |
|---|---|
|  | |

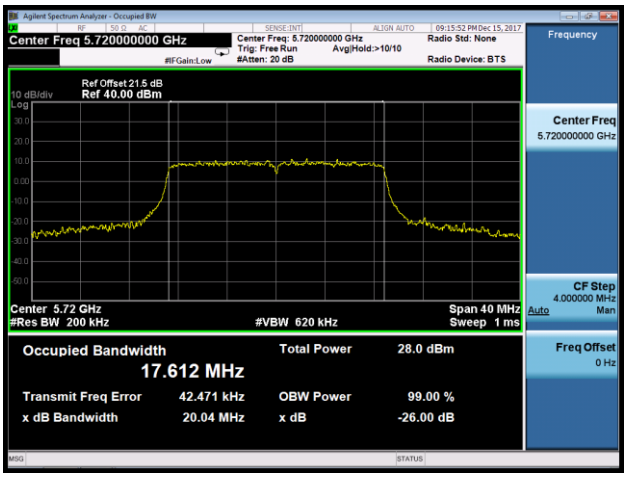
| 802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 0 | |
|---|---|
| Channel 54 (5270MHz) | Channel 62 (5310MHz) |
|  |  |
| Channel 102 (5510MHz) | Channel 118 (5590MHz) |
|  |  |
| Channel 134 (5670MHz) | Channel 142 (5710MHz) |
|  |  |

| 802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth - Ant 0 | |
|---|---|
| Channel 58 (5290MHz) | Channel 106 (5530MHz) |
|  |  |
| Channel 122 (5610MHz) | Channel 138 (5690MHz) |
|  |  |

| 802.11a 26dB Bandwidth & 99% Bandwidth - Ant 1 | |
|---|---|
| Channel 52 (5260MHz) | Channel 60 (5300MHz) |
|  |  |
| Channel 64 (5320MHz) | Channel 100 (5500MHz) |
|  |  |
| Channel 120 (5600MHz) | Channel 140 (5700MHz) |
|  |  |

| Channel 144 (5720MHz) | |
|---|---|
|  | |

| 802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 1 | |
|---|---|
| Channel 52 (5260MHz) | Channel 60 (5300MHz) |
|  |  |
| Channel 64 (5320MHz) | Channel 100 (5500MHz) |
|  |  |
| Channel 120 (5600MHz) | Channel 140 (5700MHz) |
|  |  |

| Channel 144 (5720MHz) | |
|---|---|
|  | |