MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID: 2AD6M-X20

APPLICANT: P2 Mobile Technologies Limited

Application Type: Certification

Product: MeshRanger X20 Dual 5GHz 802.11ac

Model No.: X20

FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s): Part 15.407

Test Procedure(s): KDB 789033 D02v01r01, KDB 662911 D01v02r01
KDB 644545 D03v01

Test Date: December 13, 2015 ~ January 16, 2016

Reviewed by : Robin Wu
(Robin Wu)

Approved by : Marlinchen
(Marlin Chen)

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 D02v01r01. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date
1511RSU00201	Rev. 01	Draft report	01-19-2016

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§2.1033 General Information

Applicant:	P2 Mobile Technologies Limited
Applicant Address:	Unit 708, 7/F, Bio-Informatics Centre, No. 2 Science Park West Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong
Manufacturer:	P2 Mobile Technologies Limited
Manufacturer Address:	Unit 708, 7/F, Bio-Informatics Centre, No. 2 Science Park West Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT FCC Registration No.:	809388
FCC Rule Part(s):	Part 15.407
Model No.:	X20
FCC ID:	2AD6M-X20
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 Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

ilac-MRA
American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 9 January 2009*).

Presented this 17th day of June 2014.

President & CEO
For the Accreditation Council
Certificate Number 3628.01
Valid to August 31, 2016

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

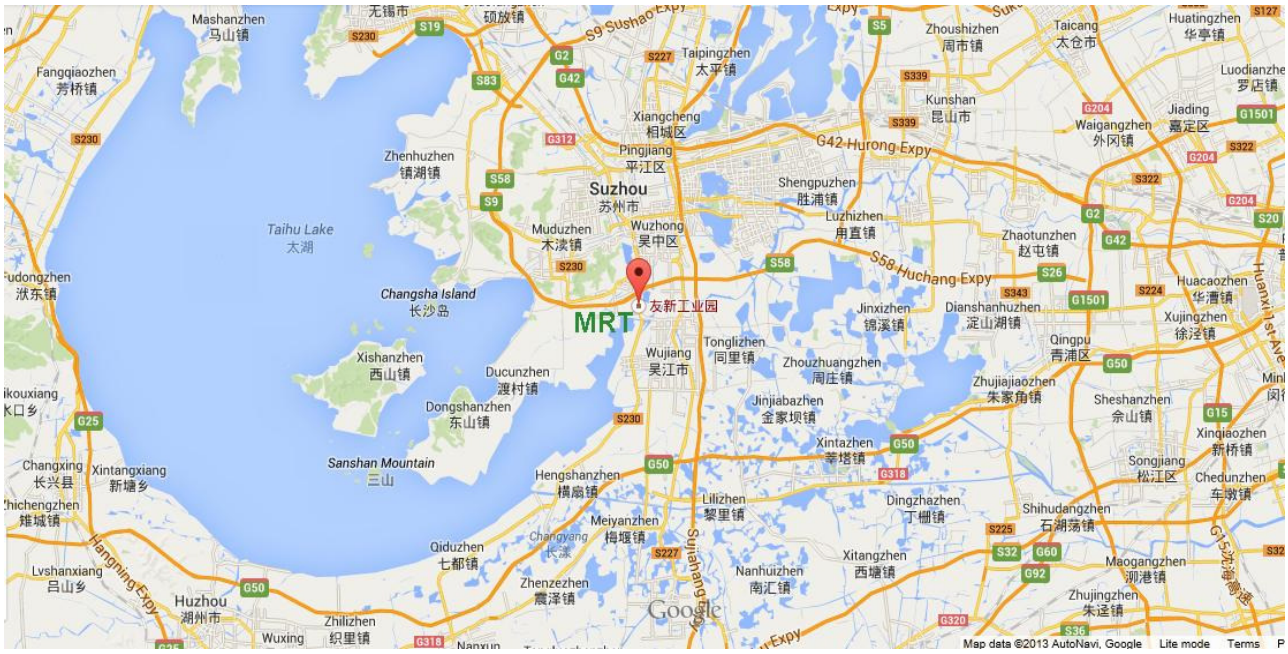
1. INTRODUCTION

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 Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	MeshRanger X20 Dual 5GHz 802.11ac
Model No.	X20
Frequency Range	For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5775MHz
Maximum Average Output Power with 5GHz Card #1	802.11a: 29.31dBm 802.11n-HT20: 29.19dBm 802.11n-HT40: 28.47dBm 802.11ac-VHT20: 29.29dBm 802.11ac-VHT40: 28.67dBm 802.11ac-VHT80: 20.85dBm
Maximum Average Output Power with 5GHz Card #2	802.11a: 28.60dBm 802.11n-HT20: 28.52dBm 802.11n-HT40: 28.05dBm 802.11ac-VHT20: 28.58dBm 802.11ac-VHT40: 28.08dBm 802.11ac-VHT80: 14.30dBm
Type of Modulation	802.11a/n/ac: OFDM

2.2. Frequency / Channel Operation

Channel List for 802.11a/n-HT20/ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

Channel List for 802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	151	5755 MHz
159	5795 MHz	--	--	--	--

Channel List for 802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	155	5775 MHz	--	--

2.3. Description of Available Antennas

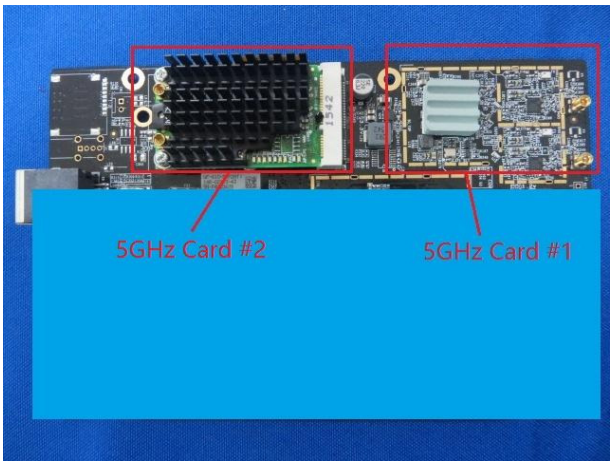
Antenna Type	Frequency Band (GHz)	Tx Paths	Max Peak Gain (dBi)	Beam Forming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Internal Antenna						
	5	2	18	21	18	21
External Antenna						
	5	2	20	23	20	23

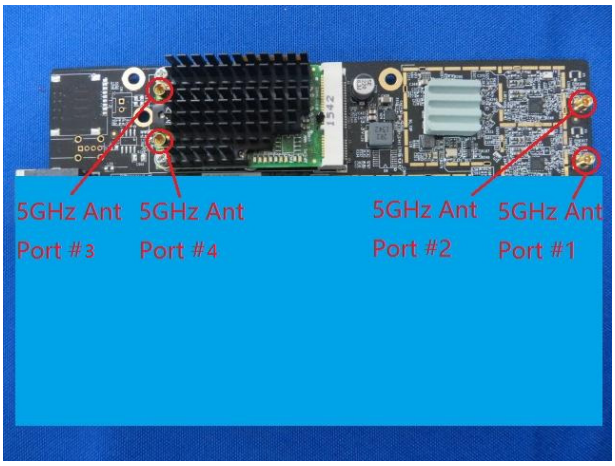
1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
   For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.
   1) If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   - 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} ≤ 4;
2. The EUT supports Beam Forming technology for 802.11n/ac mode, and exclude 802.11a mode. Correlated signals include, but are not limited to, signals transmitted in any of the following modes:
   Any transmit Beam Forming mode, whether fixed or adaptive (e.g., phased array modes, closed loop MIMO modes, Transmitter Adaptive Antenna modes, Maximum Ratio Transmission (MRT) modes, and Statistical Eigen Beam Forming (EBF) modes).
   - All antennas have the same gain, GANT:

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

2.4. Description of Antenna RF Port

Antenna RF Port				
--	5GHz Card #1 Port		5GHz Card #2 Port	
Software Control Port	Ant 1	Ant 2	Ant 1	Ant 2





Note: The EUT was fixed point-to-point access points, it was for fixed point-to-point usage. During the test, the 5GHz card #1 configurated internal atenna fixed, and the 5GHz card #2 configurated external antenna fixed.

2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11a with card #1 and antenna #1
	Mode 2: Transmit by 802.11n-HT20 with card #1 and antenna #1
	Mode 3: Transmit by 802.11n-HT40 with card #1 and antenna #1
	Mode 4: Transmit by 802.11ac-VHT20 with card #1 and antenna #1
	Mode 5: Transmit by 802.11ac-VHT40 with card #1 and antenna #1
	Mode 6: Transmit by 802.11ac-VHT80 with card #1 and antenna #1
	Mode 7: Transmit by 802.11a with card #2 and antenna #2
	Mode 8: Transmit by 802.11n-HT20 with card #2 and antenna #2
	Mode 9: Transmit by 802.11n-HT40 with card #2 and antenna #2
	Mode 10: Transmit by 802.11ac-VHT20 with card #2 and antenna #2
	Mode 11: Transmit by 802.11ac-VHT40 with card #2 and antenna #2
	Mode 12: Transmit by 802.11ac-VHT80 with card #2 and antenna #2

2.6. Test Software

The test utility software used during testing was “ART2-GUI Version: 2.3”.

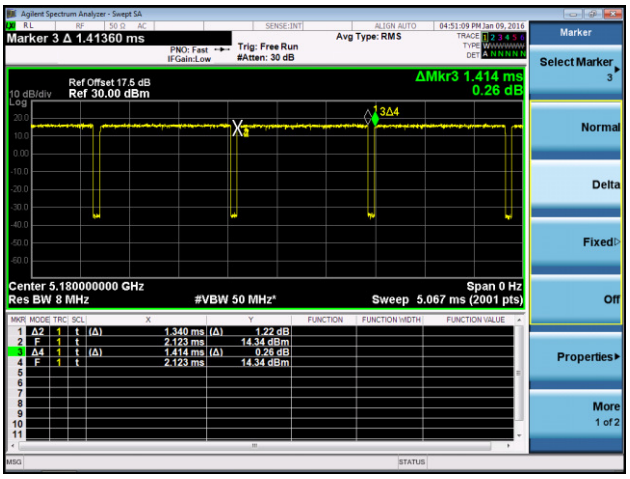
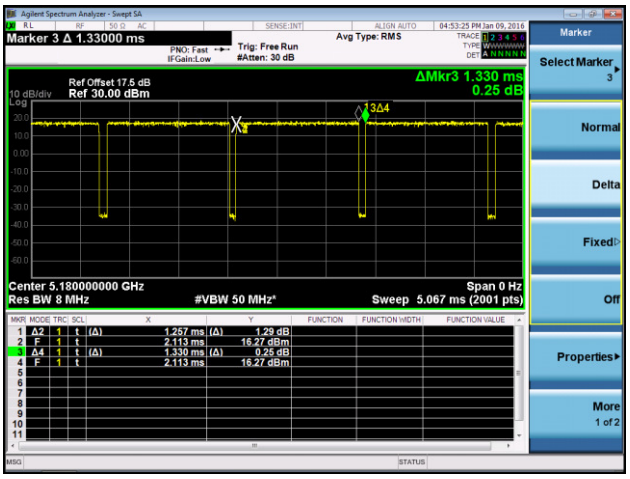
2.7. Device Capabilities

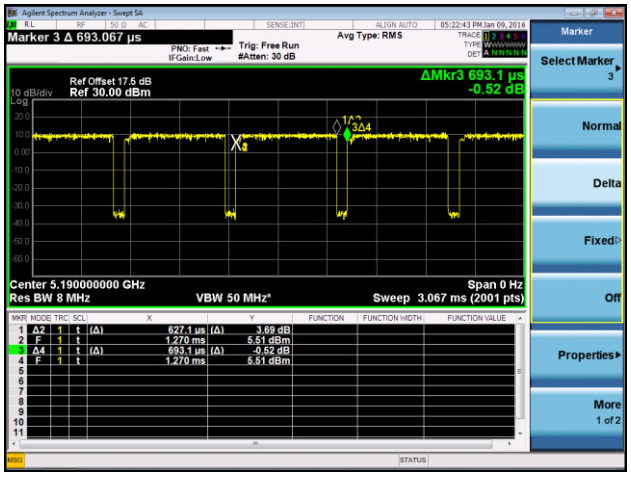
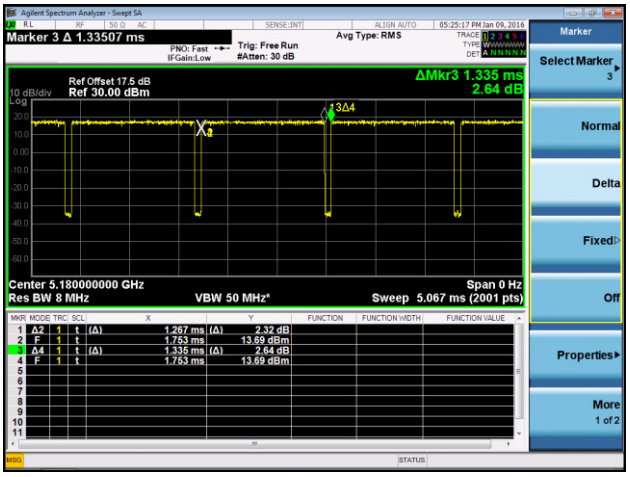
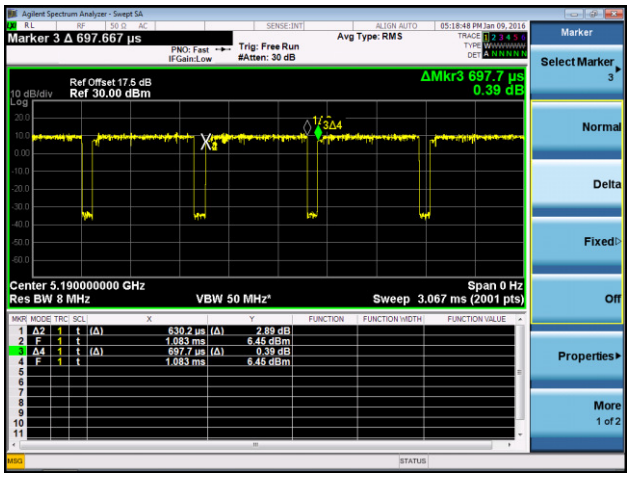
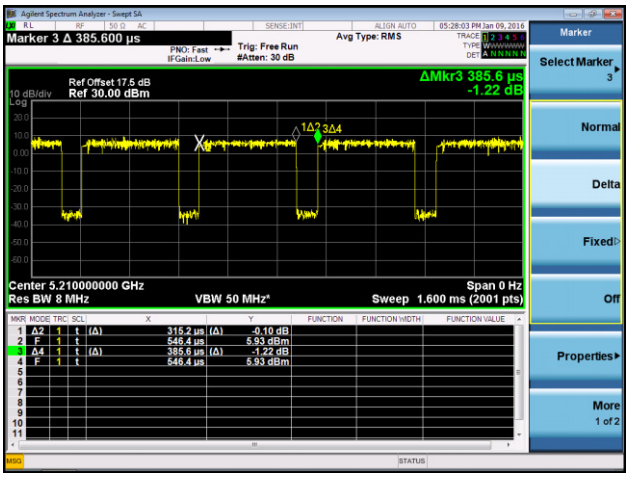
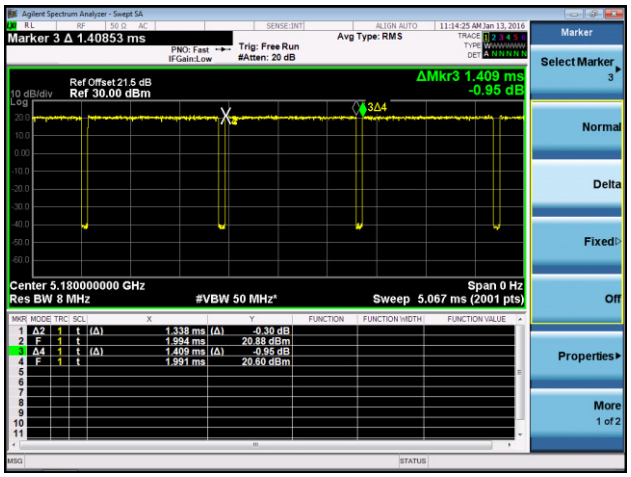
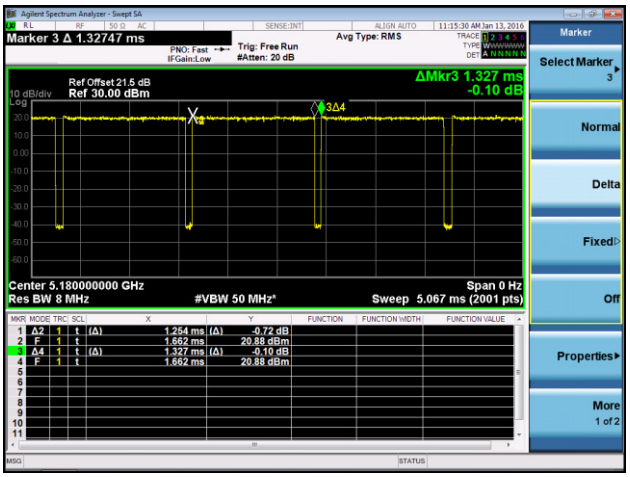
This device contains the following capabilities:

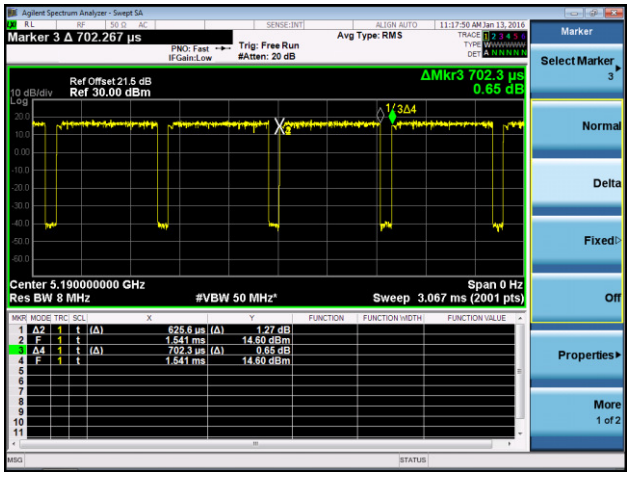
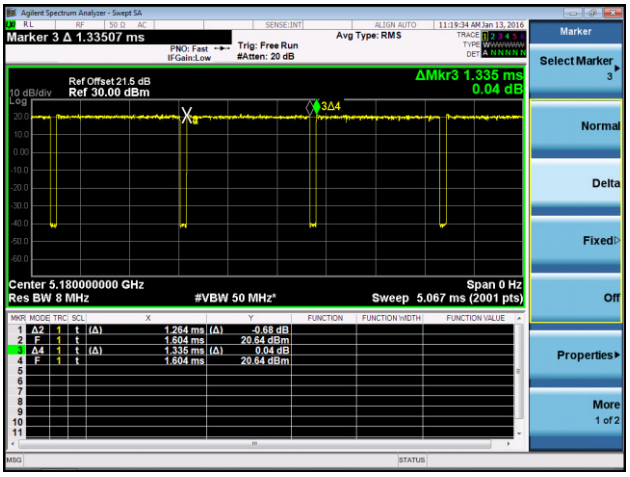
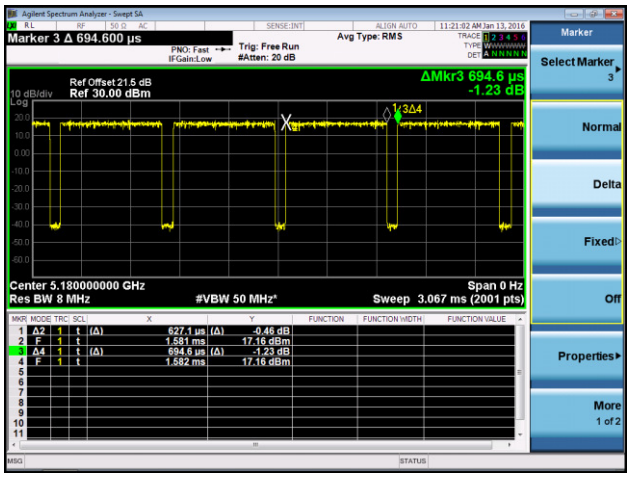
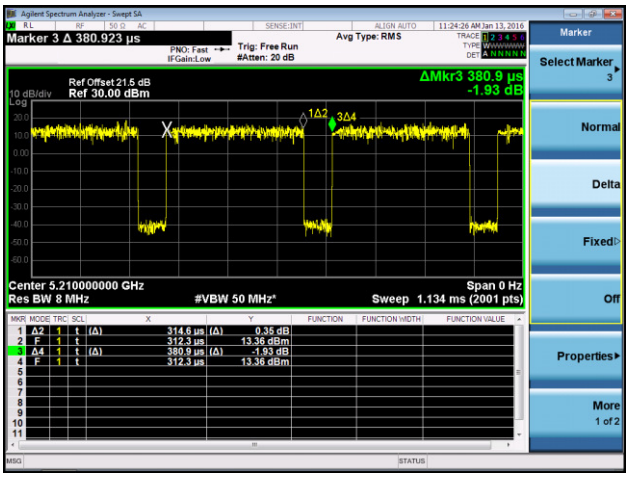
5GHz WLAN (UNII)

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

Test Mode	Duty Cycle	Test Mode	Duty Cycle
5GHz Card #1			
802.11a	94.77%	802.11n-HT20	94.51%
802.11n-HT40	90.48%	802.11ac-VHT20	94.91%
802.11ac-VHT40	90.33%	802.11ac-VHT80	81.74%
5GHz Card #2			
802.11a	94.96%	802.11n-HT20	94.50%
802.11n-HT40	89.08%	802.11ac-VHT20	94.68%
802.11ac-VHT40	90.28%	802.11ac-VHT80	82.59%

5GHz Card #1	
802.11 a - Duty Cycle	802.11 n-HT20 - Duty Cycle
	

802.11 n-HT40 - Duty Cycle	802.11 ac-VHT20 - Duty Cycle
	
802.11 ac-VHT40 - Duty Cycle	802.11 ac-VHT80 - Duty Cycle
	
5GHz Card #2	
802.11 a - Duty Cycle	802.11 n-HT20 - Duty Cycle
	

802.11 n-HT40 - Duty Cycle	802.11 ac-VHT20 - Duty Cycle
	
802.11 ac-VHT40 - Duty Cycle	**802.11 ac-VHT80 - Duty Cycle**
	

2.8. Test Configuration

The **MeshRanger X20 Dual 5GHz 802.11ac FCC ID: 2AD6M-X20** was tested per the guidance of KDB 789033 D02v01r01. 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 D02v01r01 were used in the measurement of the **MeshRanger X20 Dual 5GHz 802.11ac FCC ID:** 2AD6M-X20**.**
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. An MF Model 210SS 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."

Conclusion:

The **MeshRanger X20 Dual 5GHz 802.11ac FCC ID:** 2AD6M-X20 unit belongs to the professional installation of equipment, and doesn't need to comply with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2016/11/03
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06182	1 year	2016/12/20

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2016/06/23
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2016/03/29
Preamplifier	Schwarzbeck	BBV9721	MRTSUE06121	1 year	2016/04/15
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2016/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2016/11/07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2017/01/04
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06183	1 year	2016/12/20

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/05/08
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2016/05/08
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06180	1 year	2016/12/20

Software	Version	Function
e3	V8.3.5	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

7. TEST RESULT

7.1. Summary

Product Name: **MeshRanger X20 Dual 5GHz 802.11ac**

FCC ID: **2AD6M-X20**

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

Data Rate(s) Tested: **6Mbps ~ 54Mbps (a);**
6.5/7.2Mbps ~ 130/144.4Mbps (n-HT20MHz BW);
13.5/15.0Mbps ~ 270/300Mbps (n-HT40MHz BW);
6.5/7.2Mbps ~ 156/173.4Mbps (ac-VHT20MHz BW);
13.5/15.0Mbps ~ 360/400Mbps (ac-VHT40MHz BW);
29.3/32.5Mbps ~ 780/866.6Mbps (ac-VHT80MHz BW)

FCC Part 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)(iii), (3)	Maximum Conducted Output Power	< 30dBm U-NII-1 < 30dBm U-NII-3		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	< 24 dBm		N/A	Section 7.5
15.407(a)(1)(iii), (3), (5)	Peak Power Spectral Density	< 17dBm/MHz U-NII-1 < 14dBm/500kHz U-NII-3		Pass	Section 7.6
15.407(g)	Frequency Stability	N/A		Pass	Section 7.7
15.407(b)(1), (4)	Undesirable Emissions	< -27dBm/MHz EIRP < -17dBm/MHz EIRP	Radiated	Pass	Section 7.8 & 7.9
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 7.10

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

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) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

4) Test Items “26dB Bandwidth” & “6dB Bandwidth” have been assessed MIMO transmission, and showed the worst test data in this report.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

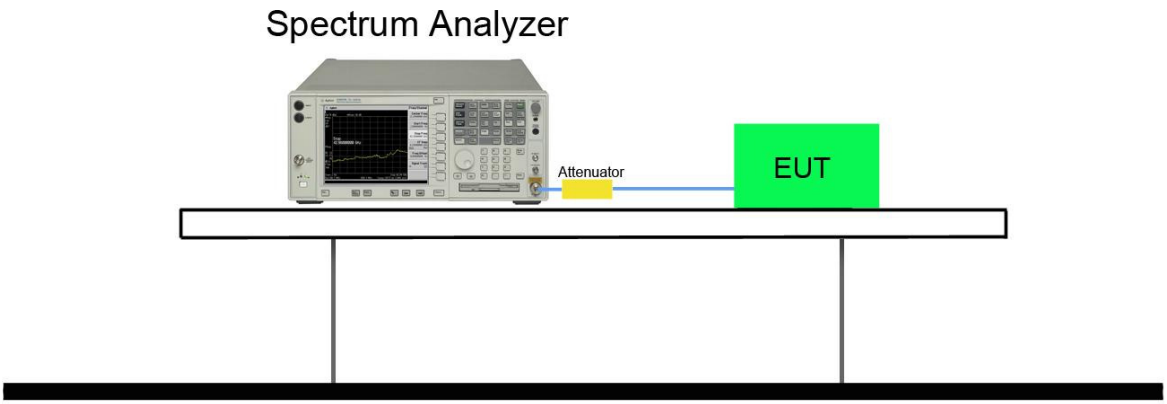
7.2.2. Test Procedure used

KDB 789033 D02v01r01 - 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

5GHz Card #1

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1						
802.11a	6	36	5180	22.45	16.68	Pass
802.11a	6	44	5220	23.60	16.76	Pass
802.11a	6	48	5240	22.28	16.71	Pass
802.11a	6	149	5745	21.47	16.68	Pass
802.11a	6	157	5785	21.75	16.67	Pass
802.11a	6	165	5825	21.69	16.66	Pass
802.11n-HT20	6.5	36	5180	22.33	17.83	Pass
802.11n-HT20	6.5	44	5220	24.26	17.85	Pass
802.11n-HT20	6.5	48	5240	22.90	17.82	Pass
802.11n-HT20	6.5	149	5745	22.76	17.84	Pass
802.11n-HT20	6.5	157	5785	22.68	17.82	Pass
802.11n-HT20	6.5	165	5825	23.11	17.83	Pass
802.11n-HT40	13.5	38	5190	44.07	36.49	Pass
802.11n-HT40	13.5	46	5230	42.80	36.41	Pass
802.11n-HT40	13.5	151	5755	44.31	36.53	Pass
802.11n-HT40	13.5	159	5795	44.48	36.46	Pass
802.11ac-VHT20	6.5	36	5180	22.42	17.82	Pass
802.11ac-VHT20	6.5	44	5220	23.43	17.84	Pass
802.11ac-VHT20	6.5	48	5240	23.58	17.82	Pass
802.11ac-VHT20	6.5	149	5745	22.58	17.82	Pass
802.11ac-VHT20	6.5	157	5785	22.62	17.84	Pass
802.11ac-VHT20	6.5	165	5825	22.87	17.82	Pass
802.11ac-VHT40	13.5	38	5190	43.77	36.49	Pass
802.11ac-VHT40	13.5	46	5230	44.65	36.47	Pass
802.11ac-VHT40	13.5	151	5755	43.46	36.46	Pass
802.11ac-VHT40	13.5	159	5795	44.05	36.42	Pass
802.11ac-VHT80	29.3	42	5210	87.66	76.04	Pass
802.11ac-VHT80	29.3	155	5775	86.01	75.91	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 2						
802.11a	6	36	5180	22.11	16.68	Pass
802.11a	6	44	5220	22.81	16.72	Pass
802.11a	6	48	5240	22.19	16.69	Pass
802.11a	6	149	5745	21.13	16.65	Pass
802.11a	6	157	5785	21.70	16.66	Pass
802.11a	6	165	5825	21.55	16.68	Pass
802.11n-HT20	6.5	36	5180	22.82	17.82	Pass
802.11n-HT20	6.5	44	5220	23.61	17.87	Pass
802.11n-HT20	6.5	48	5240	23.22	17.83	Pass
802.11n-HT20	6.5	149	5745	22.19	17.79	Pass
802.11n-HT20	6.5	157	5785	22.01	17.77	Pass
802.11n-HT20	6.5	165	5825	22.98	17.83	Pass
802.11n-HT40	13.5	38	5190	44.12	36.45	Pass
802.11n-HT40	13.5	46	5230	44.14	36.51	Pass
802.11n-HT40	13.5	151	5755	45.05	36.50	Pass
802.11n-HT40	13.5	159	5795	45.51	36.50	Pass
802.11ac-VHT20	6.5	36	5180	22.07	17.80	Pass
802.11ac-VHT20	6.5	44	5220	23.70	17.82	Pass
802.11ac-VHT20	6.5	48	5240	22.70	17.83	Pass
802.11ac-VHT20	6.5	149	5745	22.55	17.82	Pass
802.11ac-VHT20	6.5	157	5785	22.12	17.82	Pass
802.11ac-VHT20	6.5	165	5825	22.82	17.78	Pass
802.11ac-VHT40	13.5	38	5190	44.55	36.44	Pass
802.11ac-VHT40	13.5	46	5230	44.46	36.44	Pass
802.11ac-VHT40	13.5	151	5755	44.15	36.45	Pass
802.11ac-VHT40	13.5	159	5795	44.12	36.45	Pass
802.11ac-VHT80	29.3	42	5210	87.40	75.98	Pass
802.11ac-VHT80	29.3	155	5775	89.83	75.98	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1 / Ant 1 + 2						
802.11a	6	36	5180	21.53	16.67	Pass
802.11a	6	44	5220	22.91	16.73	Pass
802.11a	6	48	5240	22.07	16.72	Pass
802.11a	6	149	5745	22.04	16.69	Pass
802.11a	6	157	5785	23.38	16.69	Pass
802.11a	6	165	5825	21.14	16.63	Pass
802.11n-HT20	6.5	36	5180	22.04	17.79	Pass
802.11n-HT20	6.5	44	5220	22.56	17.82	Pass
802.11n-HT20	6.5	48	5240	23.33	17.83	Pass
802.11n-HT20	6.5	149	5745	22.11	17.77	Pass
802.11n-HT20	6.5	157	5785	22.52	17.79	Pass
802.11n-HT20	6.5	165	5825	23.21	17.82	Pass
802.11n-HT40	13.5	38	5190	43.94	36.45	Pass
802.11n-HT40	13.5	46	5230	45.27	36.47	Pass
802.11n-HT40	13.5	151	5755	43.40	36.46	Pass
802.11n-HT40	13.5	159	5795	44.11	36.36	Pass
802.11ac-VHT20	6.5	36	5180	22.82	17.81	Pass
802.11ac-VHT20	6.5	44	5220	22.86	17.82	Pass
802.11ac-VHT20	6.5	48	5240	22.88	17.85	Pass
802.11ac-VHT20	6.5	149	5745	22.39	17.82	Pass
802.11ac-VHT20	6.5	157	5785	22.50	17.82	Pass
802.11ac-VHT20	6.5	165	5825	22.71	17.80	Pass
802.11ac-VHT40	13.5	38	5190	44.62	36.50	Pass
802.11ac-VHT40	13.5	46	5230	44.30	36.40	Pass
802.11ac-VHT40	13.5	151	5755	43.69	36.42	Pass
802.11ac-VHT40	13.5	159	5795	43.63	36.42	Pass
802.11ac-VHT80	29.3	42	5210	85.83	76.10	Pass
802.11ac-VHT80	29.3	155	5775	84.03	75.62	Pass

5GHz Card #2

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1						
802.11a	6	36	5180	22.77	16.72	Pass
802.11a	6	44	5220	23.34	16.72	Pass
802.11a	6	48	5240	23.00	16.76	Pass
802.11a	6	149	5745	21.14	16.69	Pass
802.11a	6	157	5785	23.50	16.75	Pass
802.11a	6	165	5825	21.97	16.67	Pass
802.11n-HT20	6.5	36	5180	22.75	17.80	Pass
802.11n-HT20	6.5	44	5220	24.37	17.89	Pass
802.11n-HT20	6.5	48	5240	23.40	17.88	Pass
802.11n-HT20	6.5	149	5745	23.07	17.81	Pass
802.11n-HT20	6.5	157	5785	23.62	17.87	Pass
802.11n-HT20	6.5	165	5825	22.91	17.81	Pass
802.11n-HT40	13.5	38	5190	45.03	36.52	Pass
802.11n-HT40	13.5	46	5230	46.03	36.55	Pass
802.11n-HT40	13.5	151	5755	44.50	36.49	Pass
802.11n-HT40	13.5	159	5795	43.65	36.48	Pass
802.11ac-VHT20	6.5	36	5180	23.37	17.84	Pass
802.11ac-VHT20	6.5	44	5220	23.90	17.86	Pass
802.11ac-VHT20	6.5	48	5240	23.56	17.85	Pass
802.11ac-VHT20	6.5	149	5745	23.64	17.82	Pass
802.11ac-VHT20	6.5	157	5785	23.58	17.87	Pass
802.11ac-VHT20	6.5	165	5825	22.44	17.80	Pass
802.11ac-VHT40	13.5	38	5190	44.46	36.51	Pass
802.11ac-VHT40	13.5	46	5230	50.41	36.70	Pass
802.11ac-VHT40	13.5	151	5755	44.22	36.45	Pass
802.11ac-VHT40	13.5	159	5795	44.87	36.43	Pass
802.11ac-VHT80	29.3	42	5210	85.13	75.77	Pass
802.11ac-VHT80	29.3	155	5775	85.04	75.72	Pass

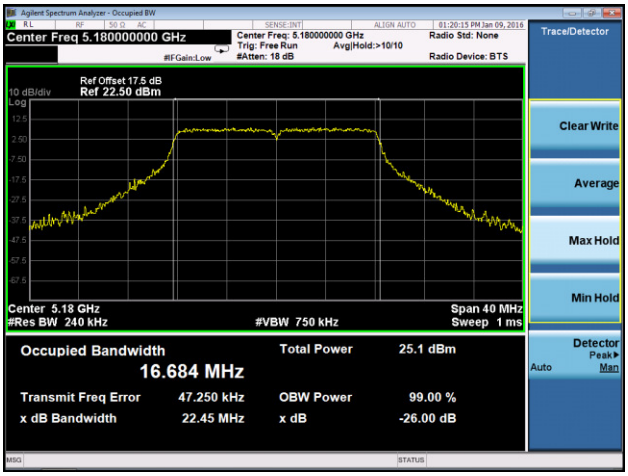
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 2						
802.11a	6	36	5180	21.67	16.65	Pass
802.11a	6	44	5220	22.52	16.70	Pass
802.11a	6	48	5240	21.58	16.68	Pass
802.11a	6	149	5745	22.16	16.70	Pass
802.11a	6	157	5785	23.08	16.76	Pass
802.11a	6	165	5825	22.58	16.71	Pass
802.11n-HT20	6.5	36	5180	22.97	17.82	Pass
802.11n-HT20	6.5	44	5220	22.67	17.84	Pass
802.11n-HT20	6.5	48	5240	23.38	17.81	Pass
802.11n-HT20	6.5	149	5745	22.50	17.81	Pass
802.11n-HT20	6.5	157	5785	23.50	17.82	Pass
802.11n-HT20	6.5	165	5825	22.72	17.80	Pass
802.11n-HT40	13.5	38	5190	44.06	36.49	Pass
802.11n-HT40	13.5	46	5230	45.19	36.45	Pass
802.11n-HT40	13.5	151	5755	42.82	36.39	Pass
802.11n-HT40	13.5	159	5795	45.75	36.49	Pass
802.11ac-VHT20	6.5	36	5180	22.03	17.80	Pass
802.11ac-VHT20	6.5	44	5220	23.94	17.85	Pass
802.11ac-VHT20	6.5	48	5240	22.76	17.82	Pass
802.11ac-VHT20	6.5	149	5745	22.97	17.78	Pass
802.11ac-VHT20	6.5	157	5785	22.44	17.82	Pass
802.11ac-VHT20	6.5	165	5825	22.16	17.77	Pass
802.11ac-VHT40	13.5	38	5190	42.47	36.46	Pass
802.11ac-VHT40	13.5	46	5230	44.83	36.47	Pass
802.11ac-VHT40	13.5	151	5755	43.26	36.41	Pass
802.11ac-VHT40	13.5	159	5795	44.65	36.56	Pass
802.11ac-VHT80	29.3	42	5210	87.63	75.91	Pass
802.11ac-VHT80	29.3	155	5775	86.16	75.80	Pass

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 1 / Ant 1 + 2						
802.11a	6	36	5180	22.00	16.69	Pass
802.11a	6	44	5220	23.58	16.77	Pass
802.11a	6	48	5240	23.72	16.75	Pass
802.11a	6	149	5745	21.44	16.68	Pass
802.11a	6	157	5785	22.84	16.70	Pass
802.11a	6	165	5825	22.14	16.68	Pass
802.11n-HT20	6.5	36	5180	22.24	17.81	Pass
802.11n-HT20	6.5	44	5220	23.69	17.88	Pass
802.11n-HT20	6.5	48	5240	24.30	17.86	Pass
802.11n-HT20	6.5	149	5745	22.49	17.81	Pass
802.11n-HT20	6.5	157	5785	22.90	17.80	Pass
802.11n-HT20	6.5	165	5825	22.00	17.76	Pass
802.11n-HT40	13.5	38	5190	44.27	36.49	Pass
802.11n-HT40	13.5	46	5230	48.01	36.56	Pass
802.11n-HT40	13.5	151	5755	43.51	36.46	Pass
802.11n-HT40	13.5	159	5795	45.00	36.44	Pass
802.11ac-VHT20	6.5	36	5180	22.51	17.83	Pass
802.11ac-VHT20	6.5	44	5220	23.67	17.87	Pass
802.11ac-VHT20	6.5	48	5240	23.69	17.87	Pass
802.11ac-VHT20	6.5	149	5745	22.27	17.80	Pass
802.11ac-VHT20	6.5	157	5785	22.09	17.82	Pass
802.11ac-VHT20	6.5	165	5825	22.22	17.76	Pass
802.11ac-VHT40	13.5	38	5190	44.84	36.50	Pass
802.11ac-VHT40	13.5	46	5230	43.73	36.44	Pass
802.11ac-VHT40	13.5	151	5755	43.96	36.37	Pass
802.11ac-VHT40	13.5	159	5795	43.72	36.50	Pass
802.11ac-VHT80	29.3	42	5210	87.26	75.93	Pass
802.11ac-VHT80	29.3	155	5775	84.34	75.74	Pass

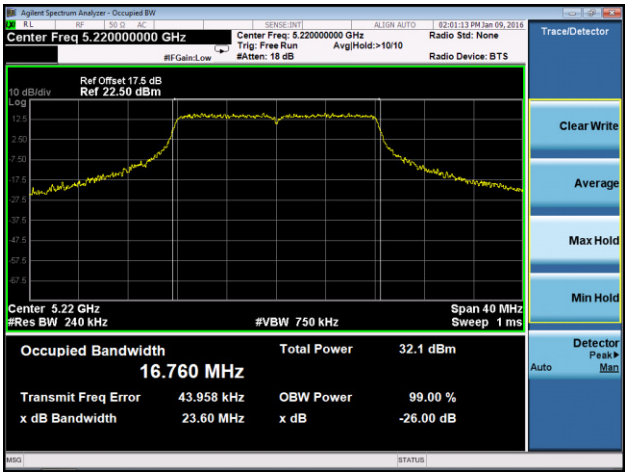
5GHz Card #1

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

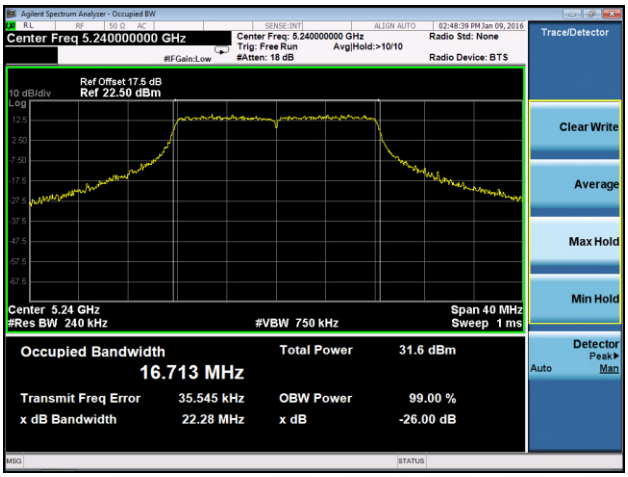
Channel 36 (5180MHz)



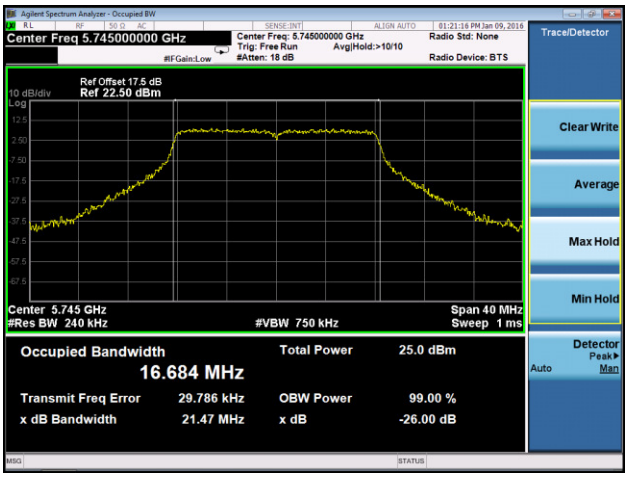
Channel 44 (5220MHz)



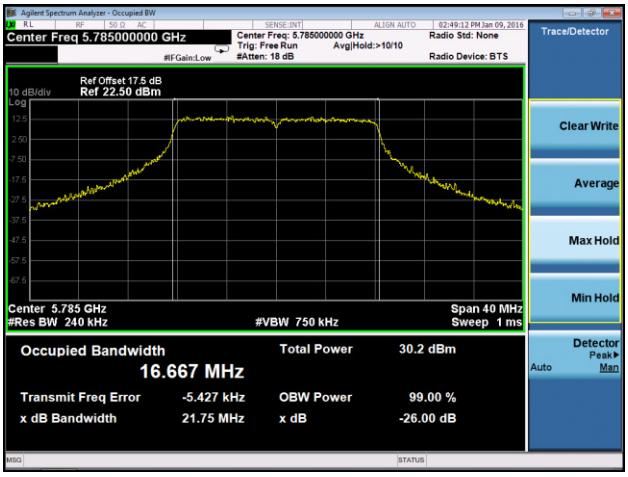
Channel 48 (5240MHz)



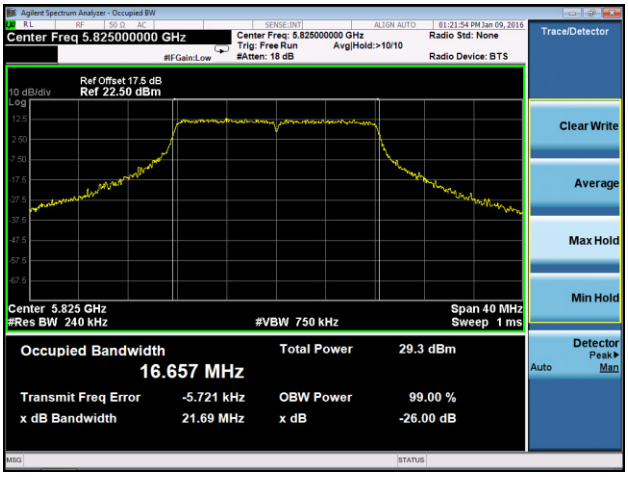
Channel 149 (5745MHz)



Channel 157 (5785MHz)

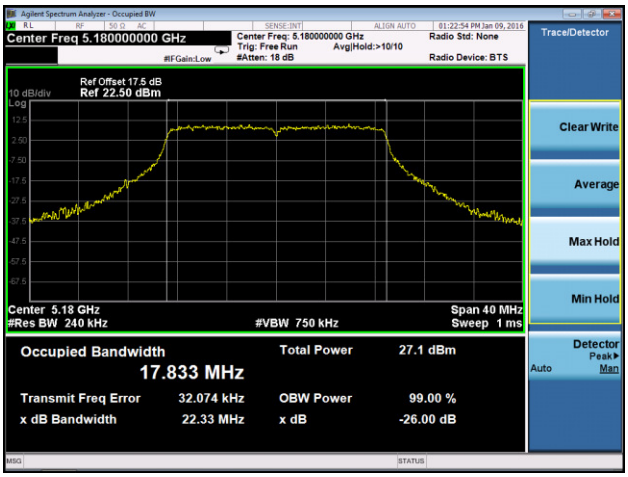


Channel 165 (5825MHz)

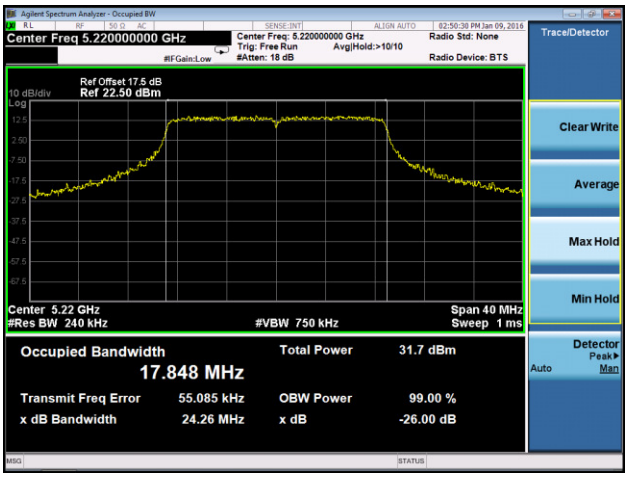


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 1

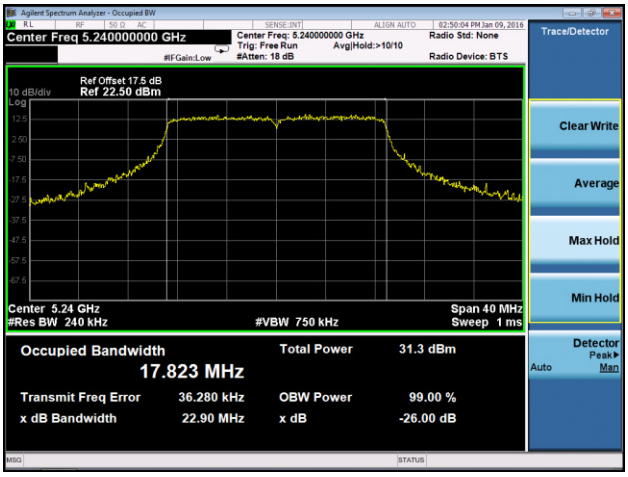
Channel 36 (5180MHz)



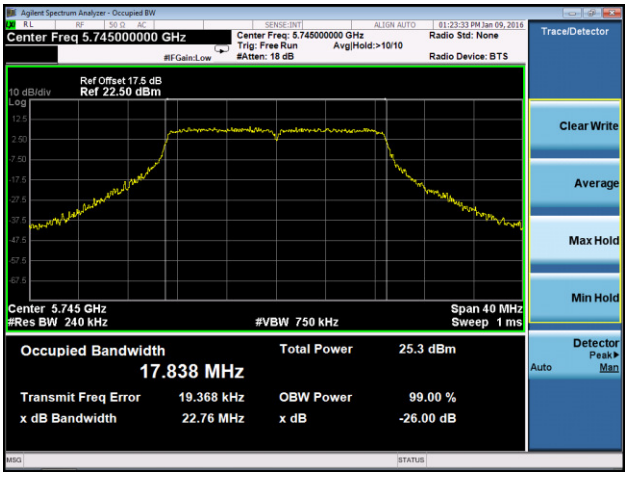
Channel 44 (5220MHz)



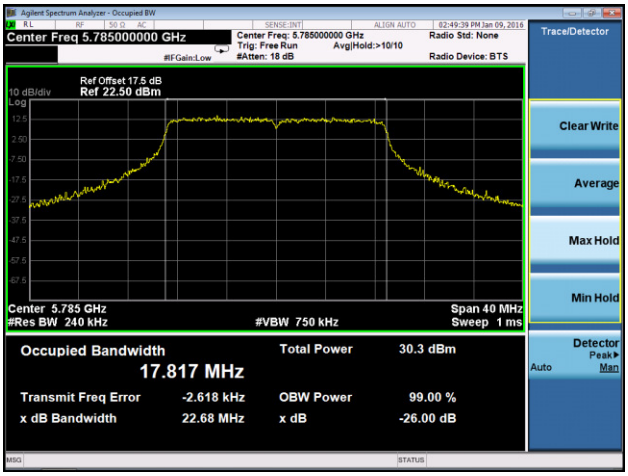
Channel 48 (5240MHz)



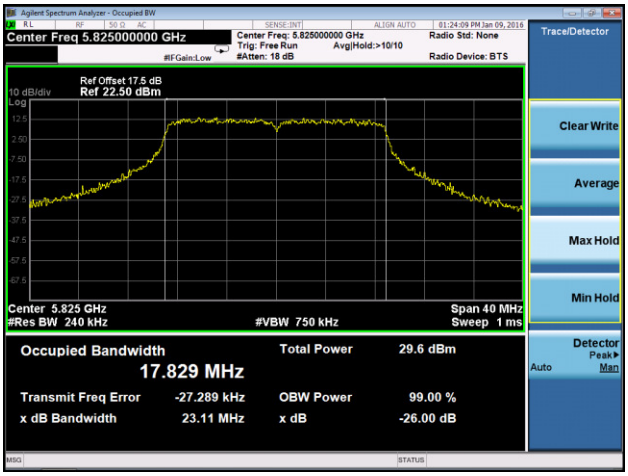
Channel 149 (5745MHz)



Channel 157 (5785MHz)

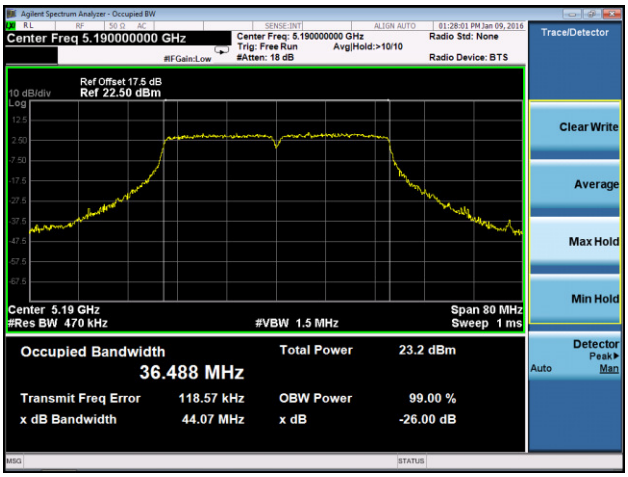


Channel 165 (5825MHz)

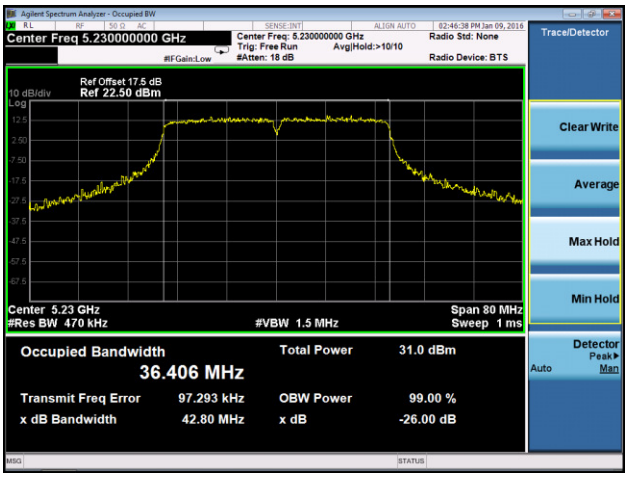


802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 1

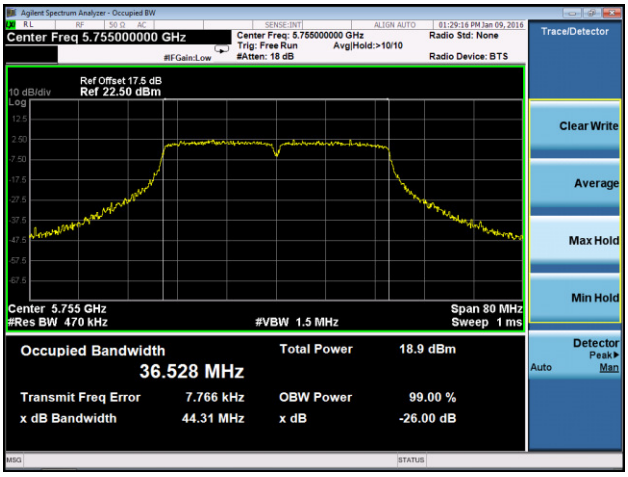
Channel 38 (5190MHz)



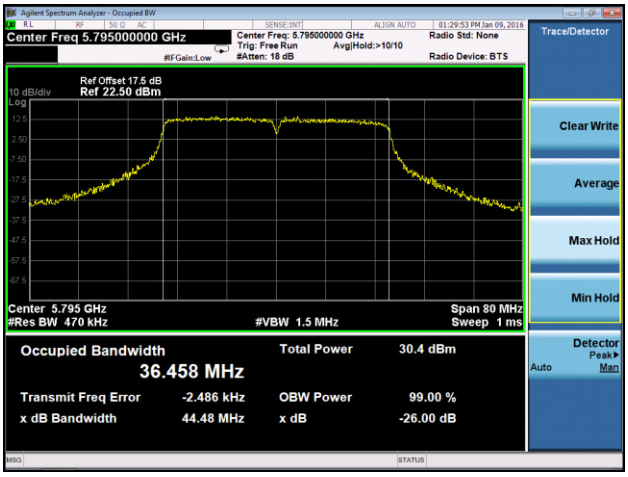
Channel 46 (5230MHz)



Channel 151 (5755MHz)

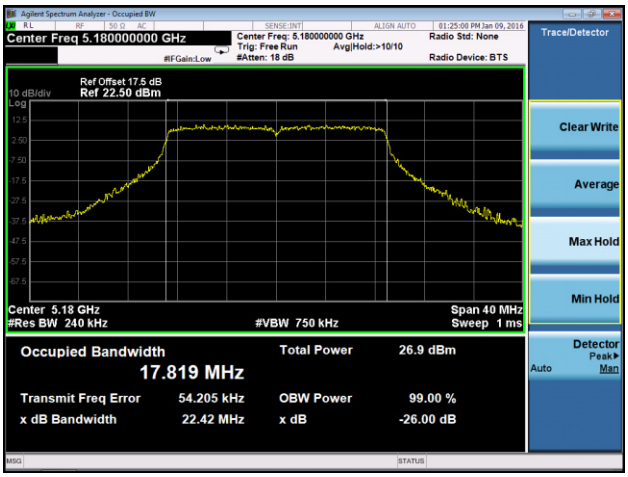


Channel 159 (5795MHz)

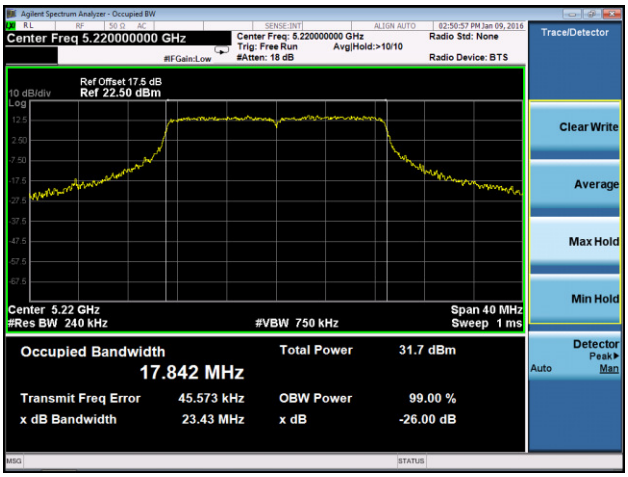


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth - Ant 1

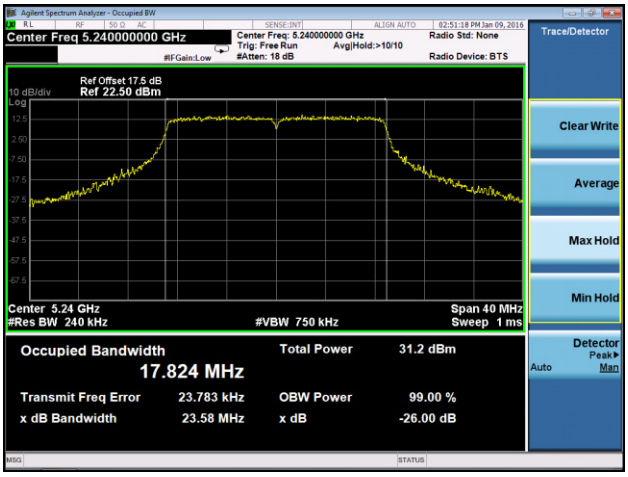
Channel 36 (5180MHz)



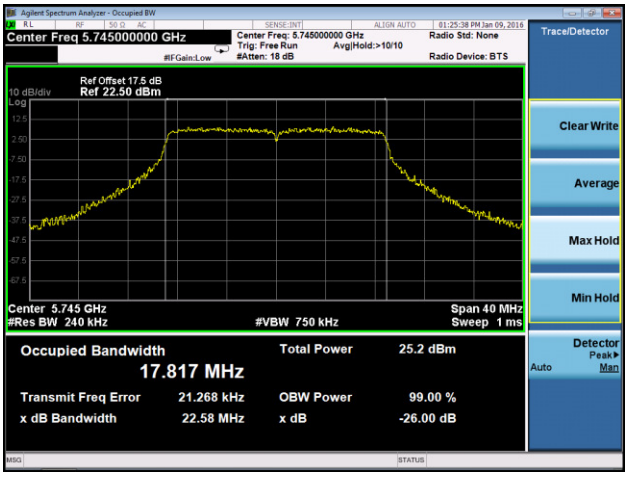
Channel 44 (5220MHz)



Channel 48 (5240MHz)

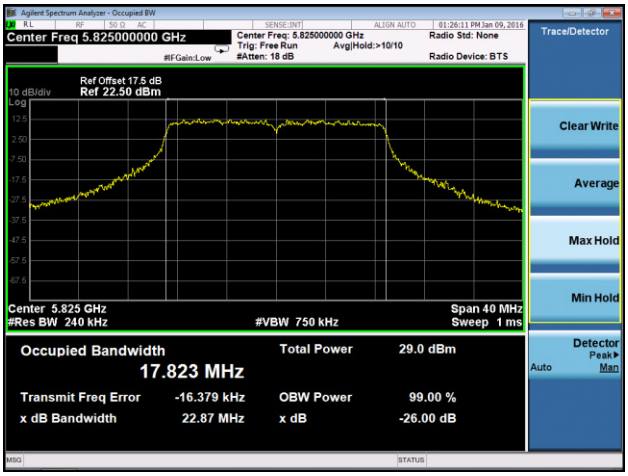


Channel 149 (5745MHz)



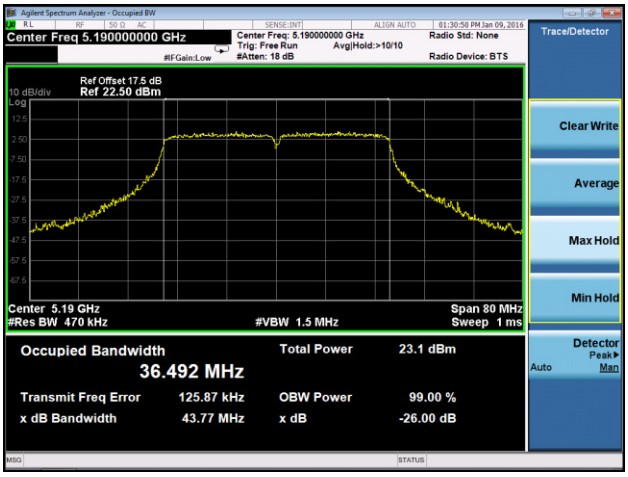
Channel 157 (5785MHz)

Channel 165 (5825MHz)

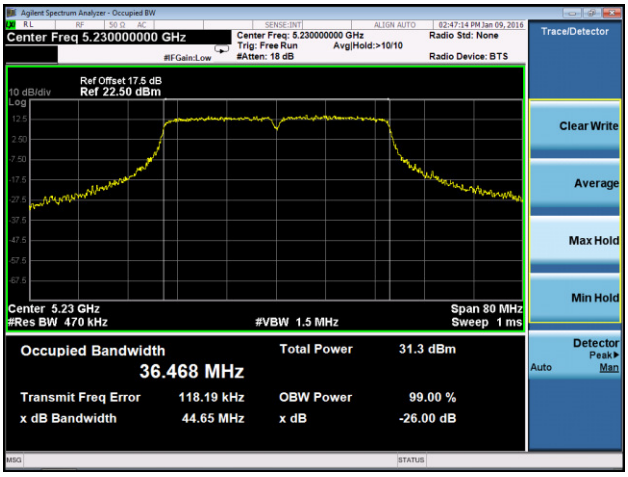


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth - Ant 1

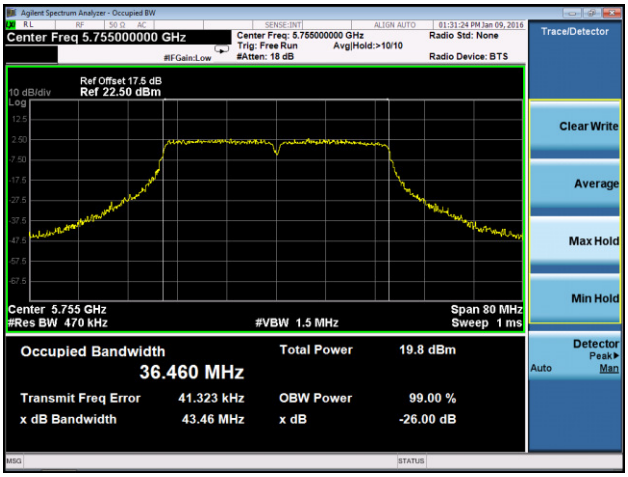
Channel 38 (5190MHz)



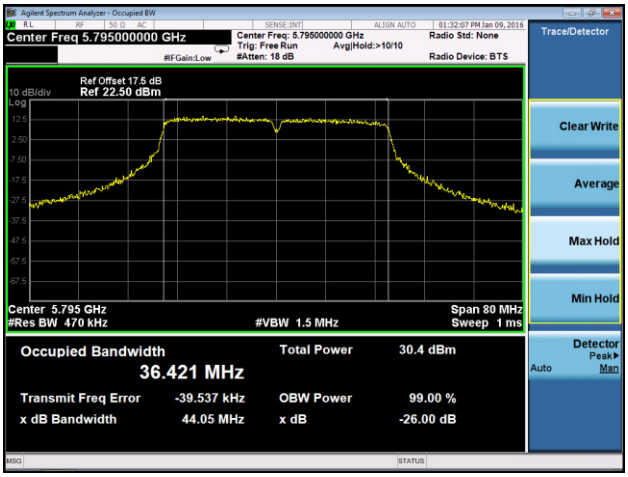
Channel 46 (5230MHz)



Channel 151 (5755MHz)

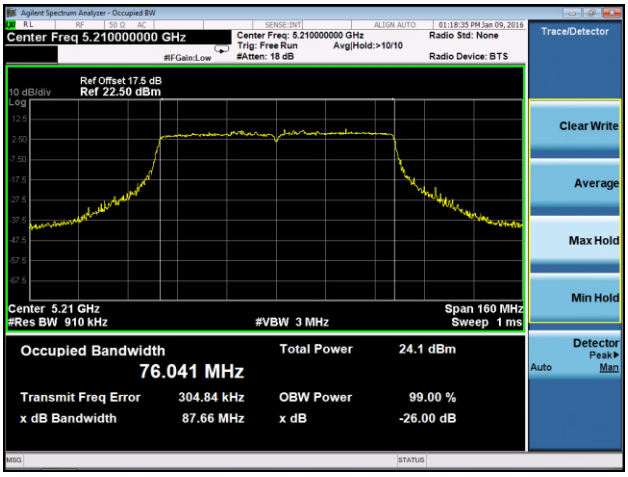


Channel 159 (5795MHz)

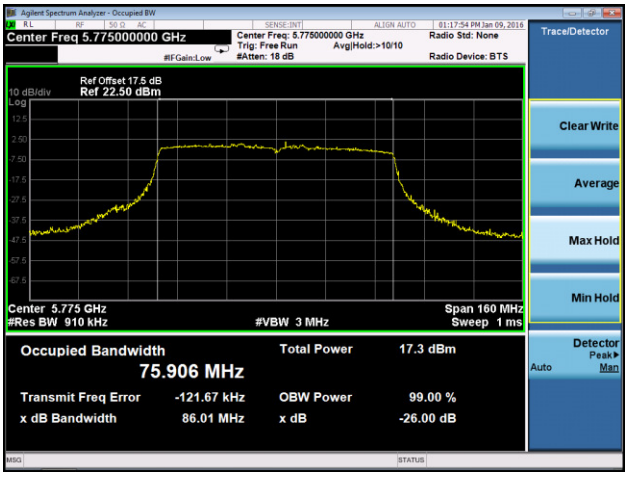


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth - Ant 1

Channel 42 (5210MHz)

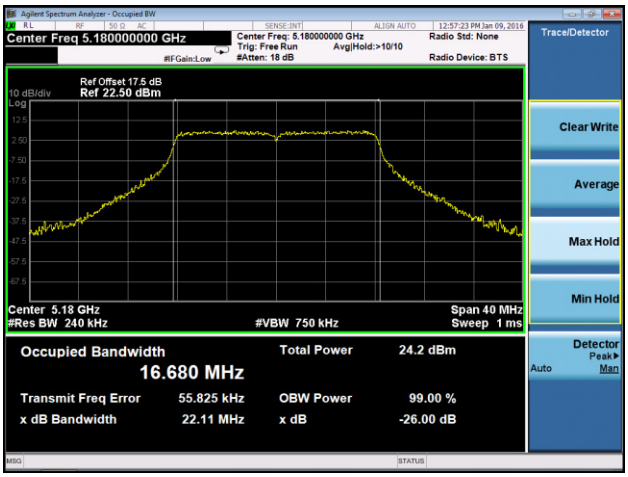


Channel 155 (5775MHz)

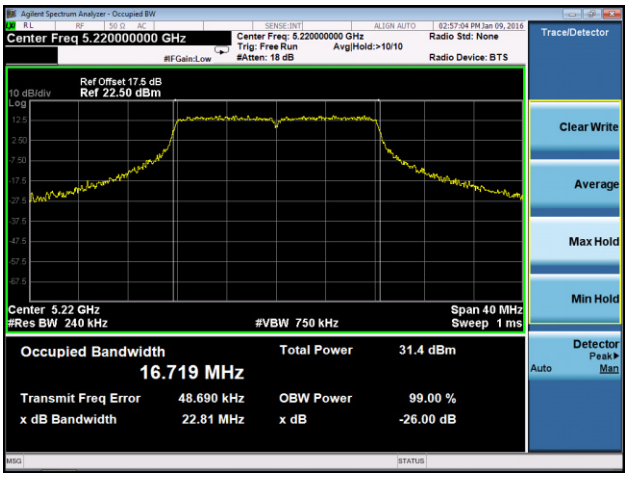


802.11a 26dB Bandwidth & 99% Bandwidth - Ant 2

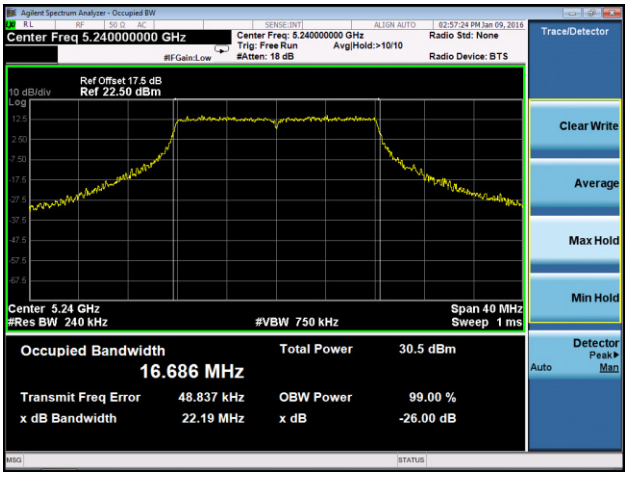
Channel 36 (5180MHz)



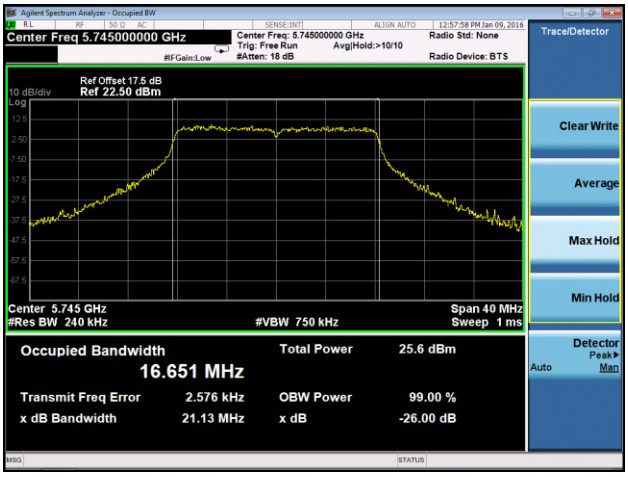
Channel 44 (5220MHz)



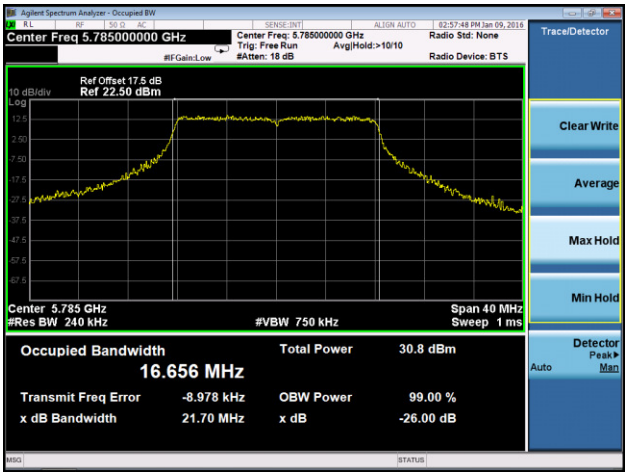
Channel 48 (5240MHz)



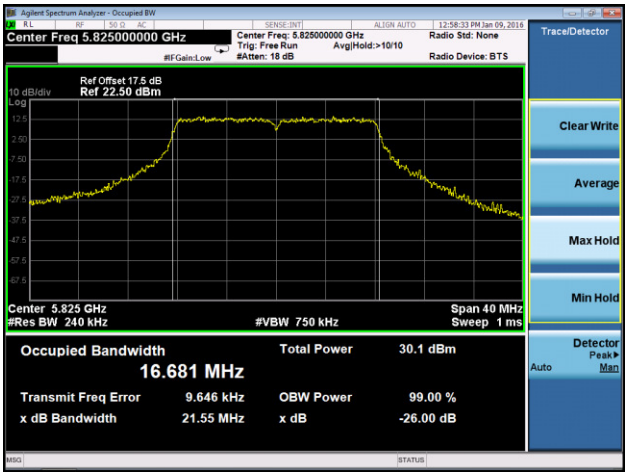
Channel 149 (5745MHz)



Channel 157 (5785MHz)

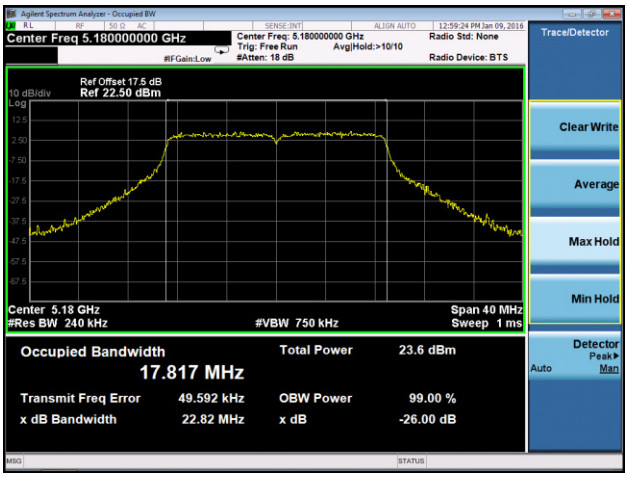


Channel 165 (5825MHz)

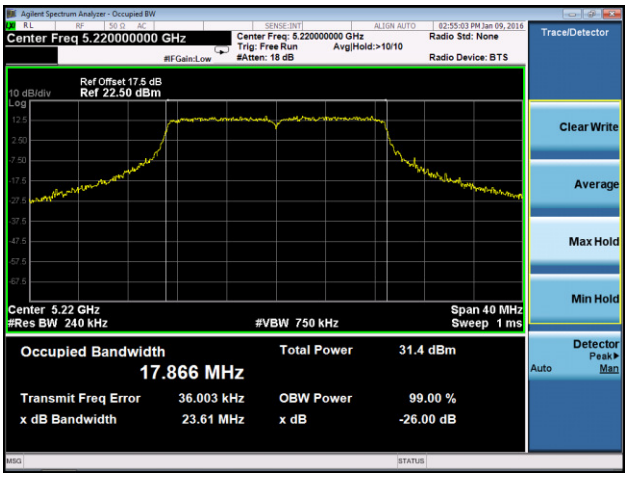


802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 2

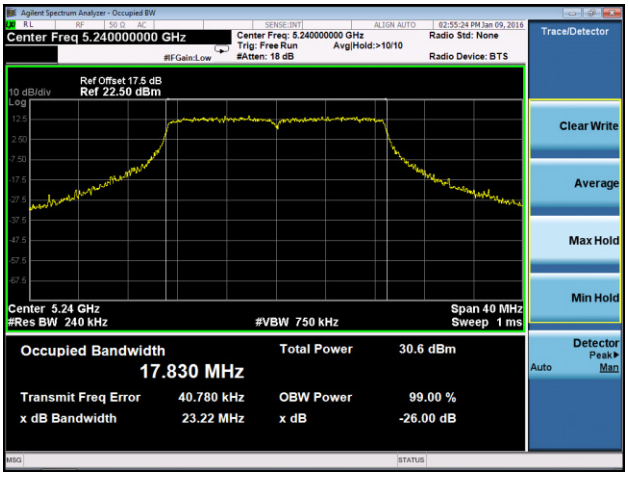
Channel 36 (5180MHz)



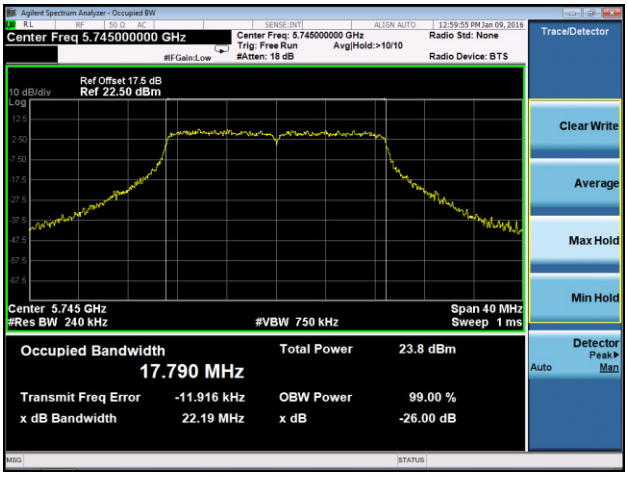
Channel 44 (5220MHz)



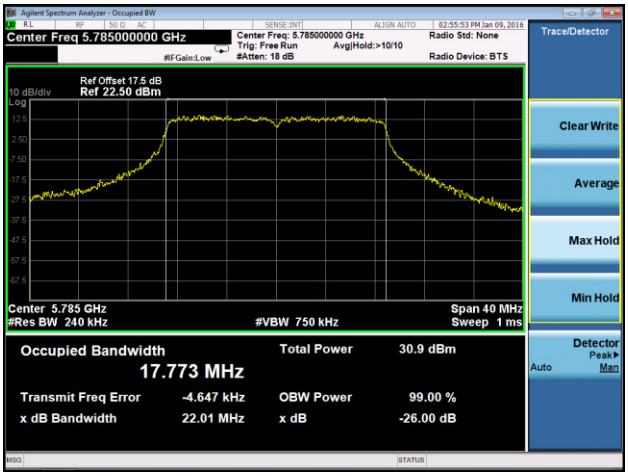
Channel 48 (5240MHz)



Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)