MEASUREMENT REPORT

FCC PART 15 Subpart C WLAN 802.11b/g/n/ac/ax

FCC ID:	TE7AX6000
APPLICANT:	TP-Link Technologies Co., Ltd.
Application Type:	Certification
Product:	AX6000 MU-MIMO Wi-Fi Router
Model No.:	Archer AX6000
Brand Name:	tp-link
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v05 KDB 662911 D01v02r01
Test Date:	August 06 ~ September 12, 2018

Reviewed By: Jame Yuan
(Jame Yuan)

Approved By: Robin Wu
(Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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 ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1808RSU004-U1	Rev. 01	Initial Report	10-16-2018	Valid

CONTENTS

Description Page

§2.1033 General Information

Applicant:	TP-Link Technologies Co., Ltd.
Applicant Address:	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China
Manufacturer:	TP-Link Technologies Co., Ltd.
Manufacturer Address:	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	893164
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

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. 893164) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.**
- **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-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications, Radio and SAR testing.**

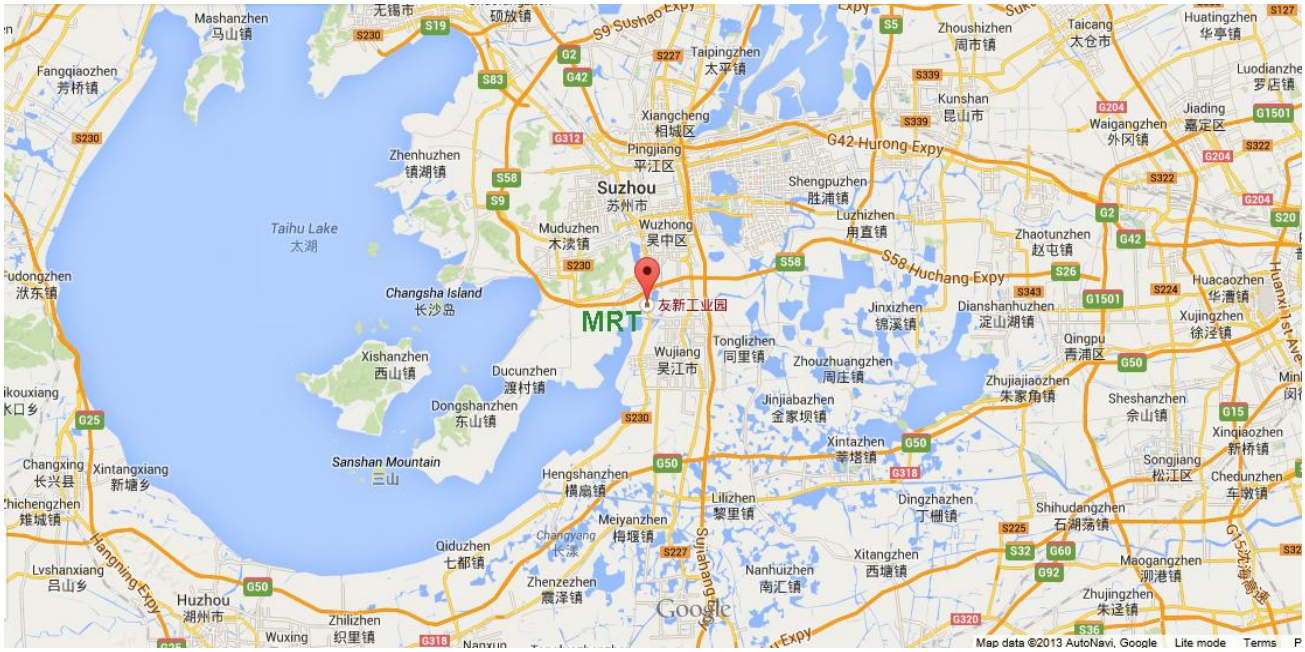
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the 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, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name:	AX6000 MU-MIMO Wi-Fi Router
Model No.:	Archer AX6000
Brand Name:	tp-link
Wi-Fi Specification:	802.11a/b/g/n/ac/ax
Bluetooth Specification:	v4.1 dual mode
Accessories	
Adapter:	MODEL: S050FU1200400 INPUT: 100 - 240V ~ 50/60Hz 1.5A Max. OUTPUT: DC 12.0V 4000mA

2.2. Product Specification Subjective to this Report

Frequency Range:	802.11b/g/n-HT20/ac-VHT20/ax-HE20: 2412 ~ 2462MHz 802.11n-HT40/ac-VHT40/ax-HE40: 2422 ~ 2452MHz
Channel Number:	802.11b/g/n-HT20/ac-VHT20/ax-HE20: 11 802.11n-HT40/ac-VHT40/ax-HE40: 7
Type of Modulation:	802.11b: DSSS 802.11g/n/ac: OFDM 802.11ax:OFDMA
Data Rate:	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 600Mbps 802.11ac: up to 800Mbps 802.11ax: up to 1148Mbps

Note: For other features of this EUT, test report will be issued separately.

2.3. Working Frequencies for this report

802.11b/g/n-HT20/ac-VHT20/ax-HE20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

802.11n-HT40/ac-VHT40/ax-HE40

Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	--	--	--	--

2.4. Description of Available Antennas

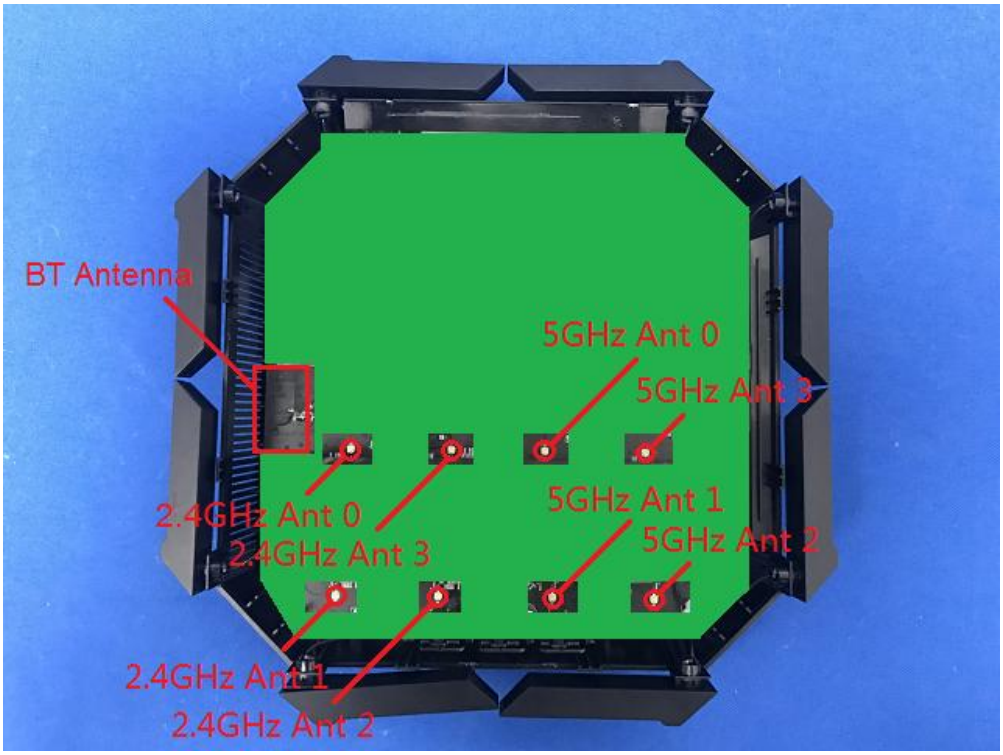
Antenna Type	Frequency Band (MHz)	TX Paths	Max Antenna Gain (dBi)	BF Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Wi-Fi External Antenna						
Dipole Antenna	2412 ~ 2462	4	1.16	7.18	1.16	7.18
	5150 ~ 5850	4	2.28	8.30	2.28	8.30
Bluetooth Internal Antenna						
PCB Antenna	2402 ~ 2480	1	4.05	--	--	--

Note:

1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
   For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 4, N_{SS} = 1.
   If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   - For power spectral density (PSD) measurements on all devices,
     Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 6.02;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. The EUT also supports Beam Forming mode, and the Beam Forming support 802.11ac/ax, not include 802.11a/b/g/n. BF Directional gain = G_{ANT} + 10 log (N_{ANT}).

2.5. Description of Antenna RF Port

Antenna RF Port									
Software Control Port	2.4GHz RF Port				5GHz RF Port				Bluetooth
	Ant 0	Ant 1	Ant 2	Ant 3	Ant 0	Ant 1	Ant 2	Ant 3	--



2.6. Test Mode

Test Mode	Mode 1: Transmit by 802.11b (1Mbps) (CDD Mode)
	Mode 2: Transmit by 802.11g (6Mbps) (CDD Mode)
	Mode 3: Transmit by 802.11n-HT20 (MCS0) (CDD Mode)
	Mode 4: Transmit by 802.11n-HT40 (MCS0) (CDD Mode)
	Mode 5: Transmit by 802.11ac-VHT20 (MCS0) (CDD Mode)
	Mode 6: Transmit by 802.11ac-VHT40 (MCS0) (CDD Mode)
	Mode 7: Transmit by 802.11ax-HE20 (MCS0) (CDD Mode)
	Mode 8: Transmit by 802.11ax-HE40 (MCS0) (CDD Mode)
	Mode 9: Transmit by 802.11ac-VHT20 (MCS0) (BF Mode)
	Mode 10: Transmit by 802.11ac-VHT40 (MCS0) (BF Mode)
	Mode 11: Transmit by 802.11ax-HE20 (MCS0) (BF Mode)
	Mode 12: Transmit by 802.11ax-HE40 (MCS0) (BF Mode)

2.7. Description of Test Software

The test utility software used during testing was “accessMTool”, and the version was “v3.1.0.1”.

Power Parameter Value

Test Mode	Test Frequency (MHz)	Power Parameter Value Ant 0 + 1 + 2 +3	Test Mode	Test Frequency (MHz)	Power Parameter Value Ant 0 + 1 + 2 +3	
					CDD Mode	Beam-Forming Mode
11b	2412	91	11ac-VHT20	2412	77	76
	2437	91		2417	90	80
	2462	91		2437	90	88
11g	2412	81		2457	86	84
	2417	90		2462	77	76
	2422	90	11ac-VHT40	2422	68	88
	2437	90		2427	68	88
	2452	90		2432	77	88
	2457	88		2437	80	80
	2462	76		2442	77	80
11n-HT20	2412	74		2447	70	80
	2417	86		2452	70	80
	2422	91	11ax-HE20	2412	70	72
	2437	91		2417	84	80
	2452	91		2422	89	84
	2457	86		2427	89	88
	2462	72		2437	89	88
11n-HT40	2422	70		2447	89	88
	2427	74		2452	88	88
	2432	78		2457	83	76
	2437	78		2462	74	68
	2442	77	11ax-HE40	2422	68	80
	2447	72		2427	70	80
	2452	68		2432	76	80
--	--	--		2437	76	80
--	--	--		2442	71	80
--	--	--		2447	69	80
--	--	--		2452	70	84

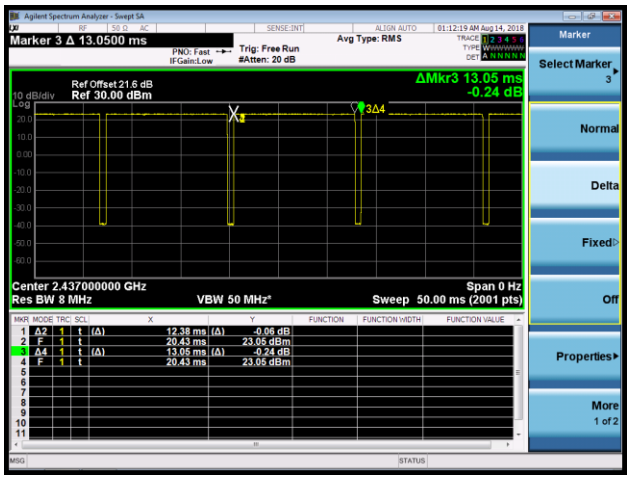
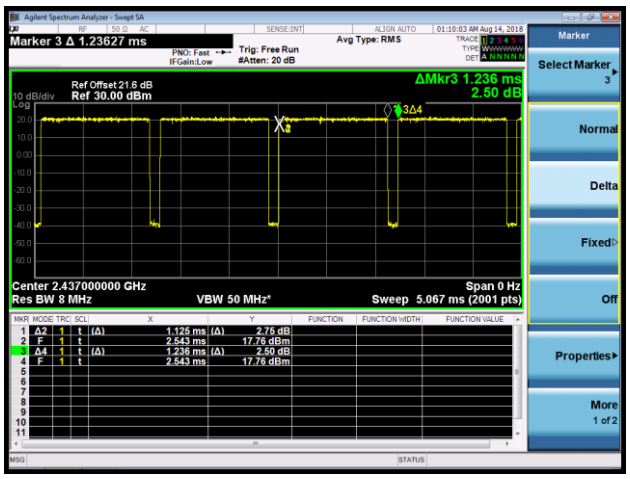
2.8. Device Capabilities

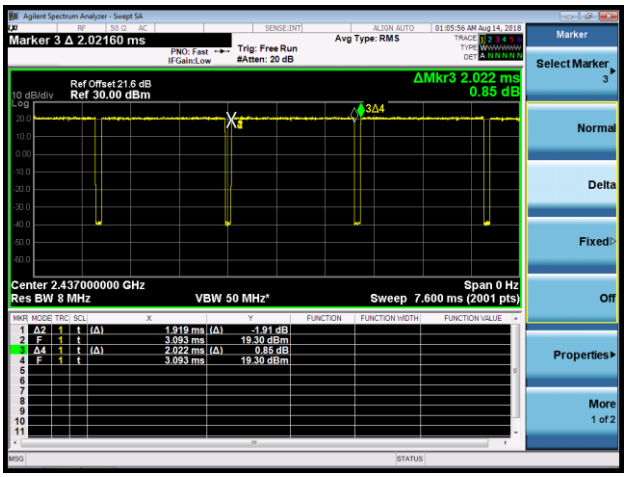
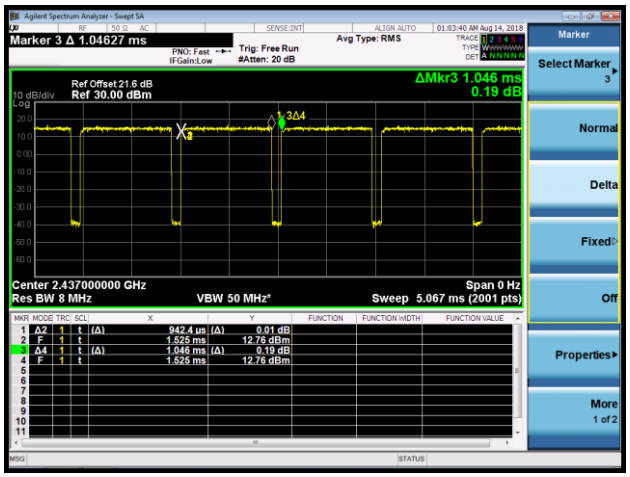
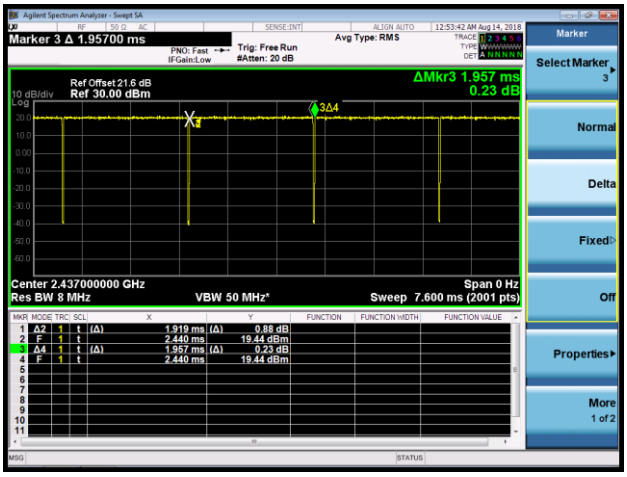
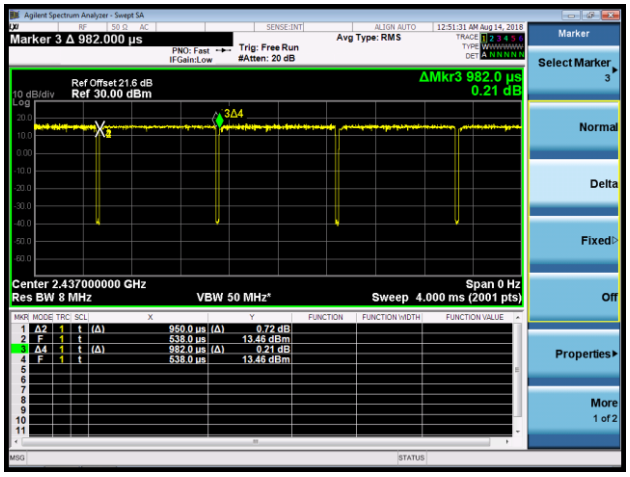
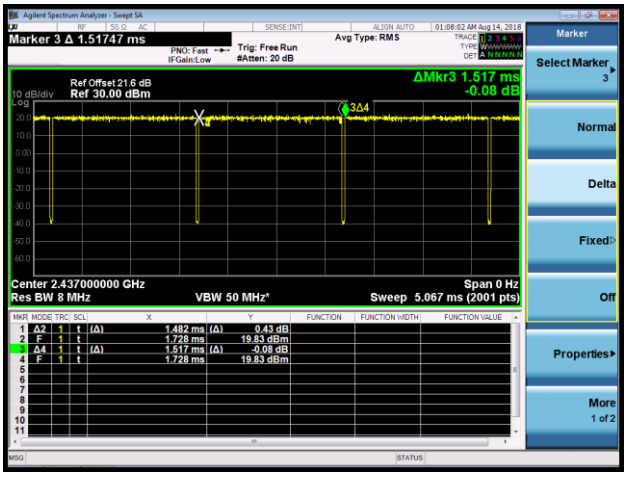
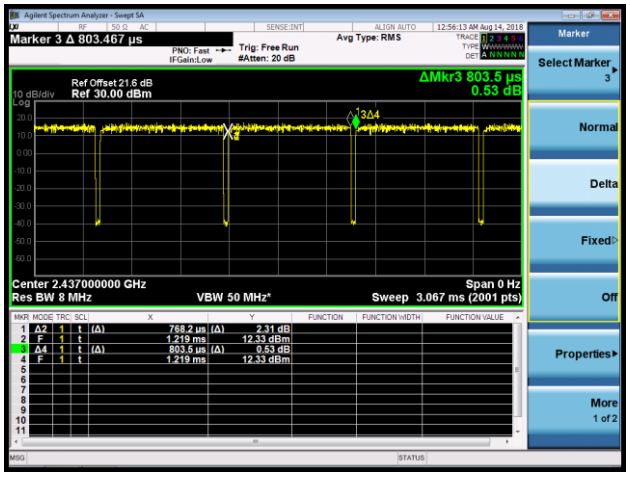
This device contains the following capabilities:

2.4GHz WLAN (DTS), 5GHz WLAN (UNII), Bluetooth v4.1 (Dual mode)

Note: 2.4GHz WLAN (DTS) operation is possible in 20MHz and 40MHz 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:

Model No.	Test Mode	Duty Cycle
Archer AX6000	802.11b	94.87%
	802.11g	91.02%
	802.11n-HT20	94.91%
	802.11n-HT40	91.10%
	802.11ac-VHT20	98.06%
	802.11ac-VHT40	96.97%
	802.11ax-HE20	97.69%
	802.11ax-HE40	95.61%

Duty Cycle (T = Transmission Duration)	
802.11b (T = 12.38ms)	802.11g (T = 1.125ms)
	

Duty Cycle (T = Transmission Duration)	
802.11n-HT20 (T = 1.919ms)	802.11n-HT40 (T = 942.4us)
	
802.11ac-VHT20 (T = 1.919ms)	802.11ac-VHT40 (T = 950.0us)
	
802.11ax-HE20 (T = 1.482ms)	802.11ax-HE40 (T = 768.2us)
	

2.9. Test Configuration

The **AX6000 MU-MIMO Wi-Fi Router** was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.10. EMI Suppression Device(s)/Modifications

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

2.11. 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 was used in the measurement of the **AX6000 MU-MIMO Wi-Fi Router.**

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.

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, 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."

- The antenna of the **AX6000 MU-MIMO Wi-Fi Router** 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 - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2019/04/20
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2019/06/15
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2019/06/15
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2018/08/15
				1 year	2019/08/15
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	N/A	N/A

Radiated Emissions - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/14
				1 year	2019/08/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2019/07/20
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2018/11/20
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2018/10/21
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2018/11/18
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2018/12/14
Broadband Coaxial Preamplifier	Agilent	BBV 9718	MRTSUE06176	1 year	2018/11/17
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2019/06/13
Digitial Thermometer & Hygrometer	MingGao	ETH529	MRTSUE06170	1 year	2018/12/12
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2019/05/02

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9020A	MRTSUE06106	1 year	2019/04/20
USB wideband power sensor	KEYSIGHT	U2021XA	MRTSUE0644	1 year	2019/07/20
Attenuator	MVE	MVE2211-10	MRTSUE06800	1 year	2019/07/10
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2018/12/06
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2018/08/15
				1 year	2019/08/15

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 - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Spurious Emissions, Conducted - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
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

Product Name: **AX6000 MU-MIMO Wi-Fi Router**

FCC ID: **TE7AX6000**

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 30dBm		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm/3kHz		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 30dBc(Average)		Pass	Section 7.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.6 & 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All modes of operation and data rates were investigated. 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.
3) Test Items “6dB Bandwidth” & “Band Edge / Out-of-Band Emissions” have been assessed MIMO transmission, and showed the worst test data in this report.

7.2. 6dB Bandwidth Measurement

7.2.1.Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

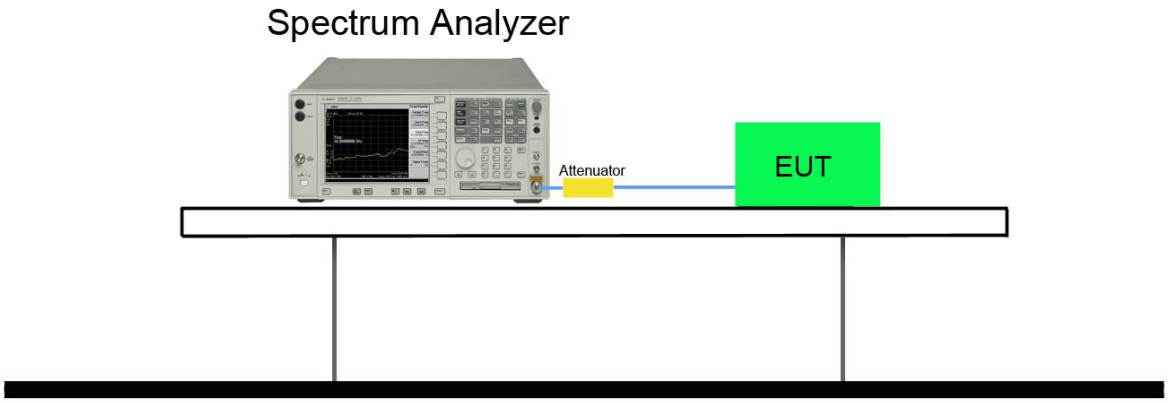
7.2.2.Test Procedure used

ANSI C63.10-2013 Section 11.8

7.2.3.Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

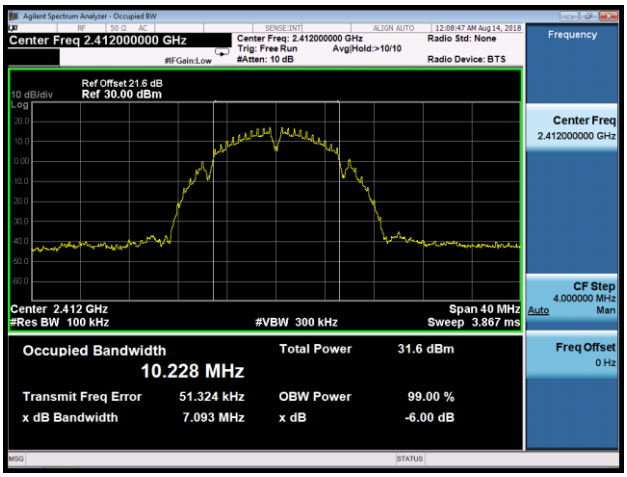
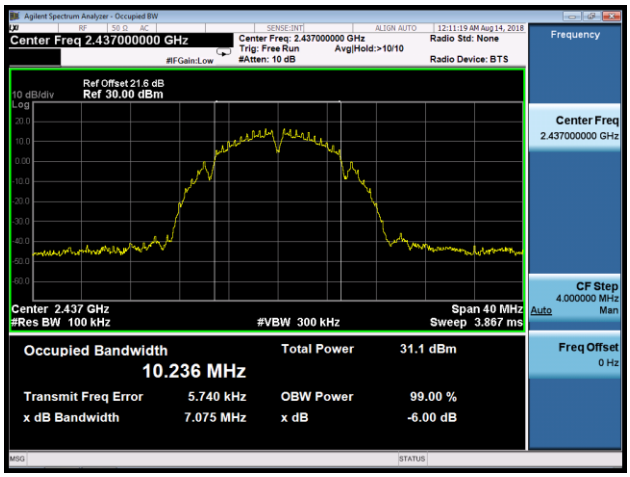
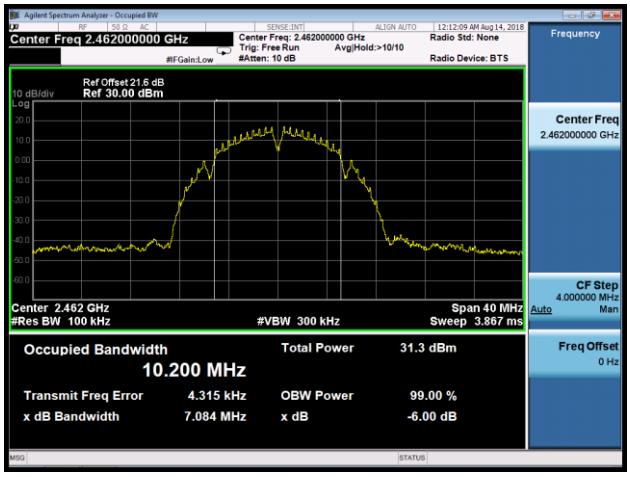
7.2.4.Test Setup

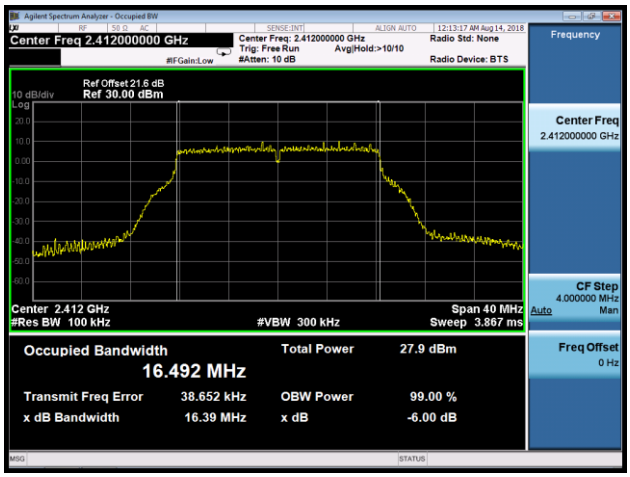
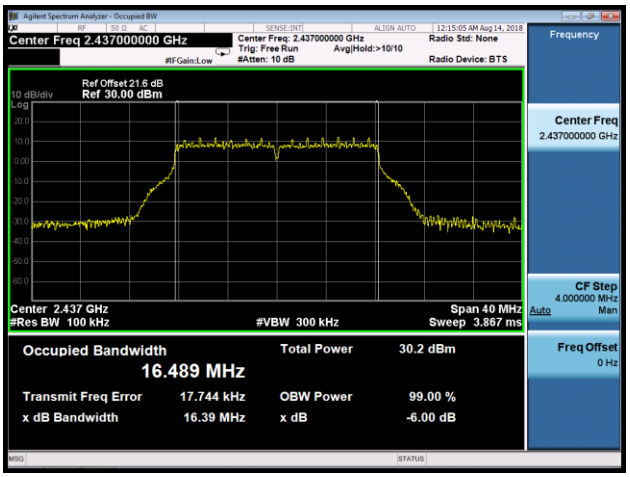
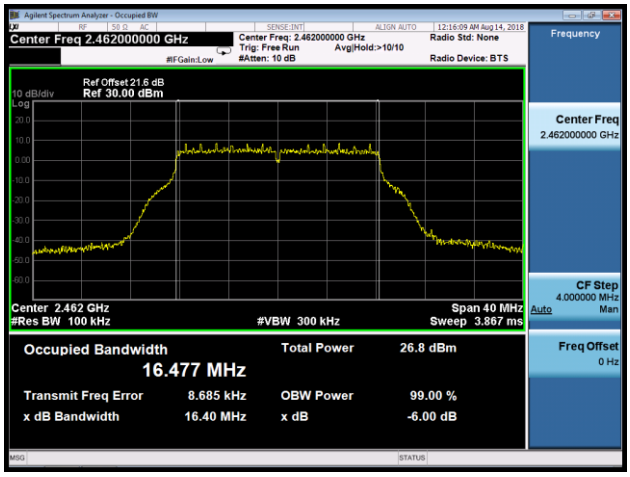


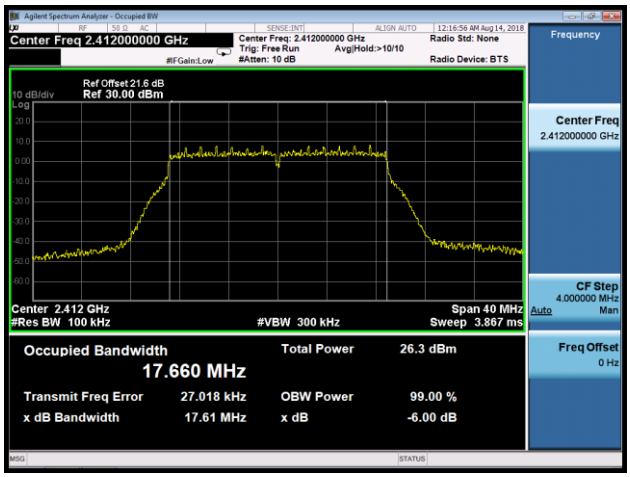
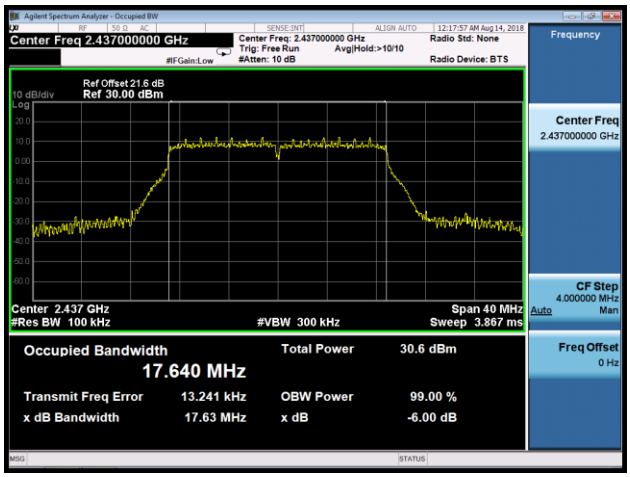
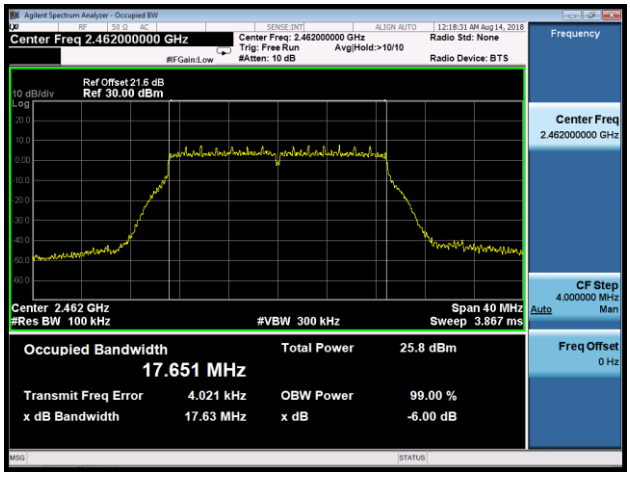
7.2.5.Test Result

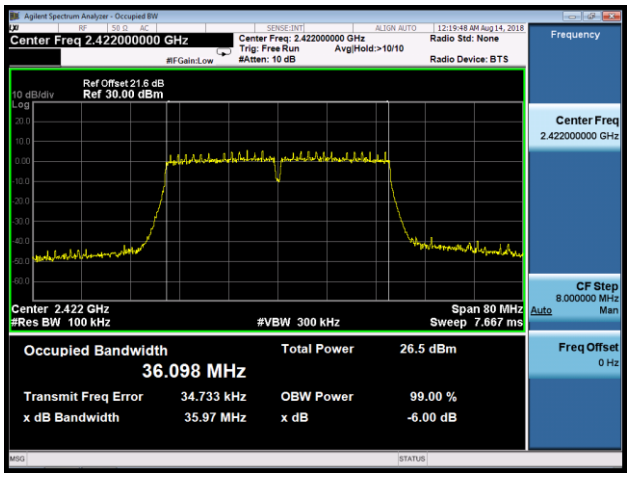
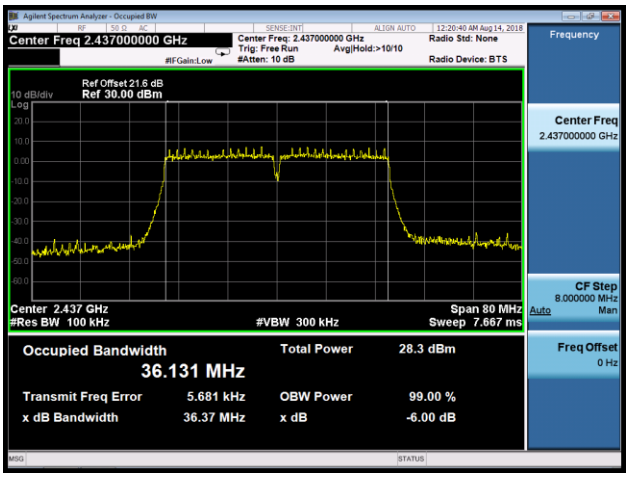
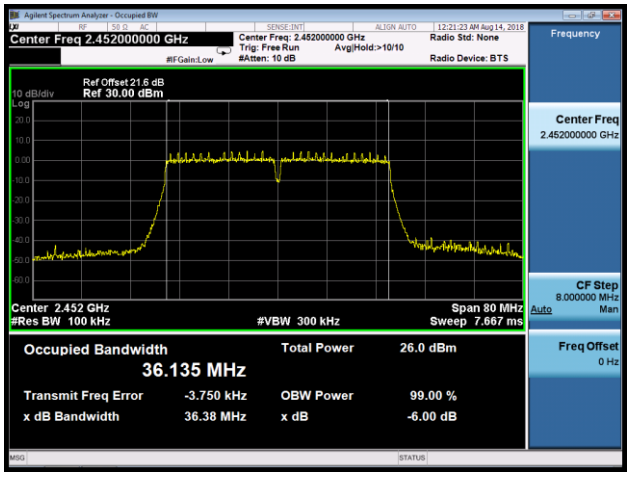
Product	AX6000 MU-MIMO Wi-Fi Router	Temperature	25°C
Test Engineer	Flag Yang	Relative Humidity	54%
Test Site	TR3	Test Date	2018/08/14
Test Item	6dB Bandwidth		

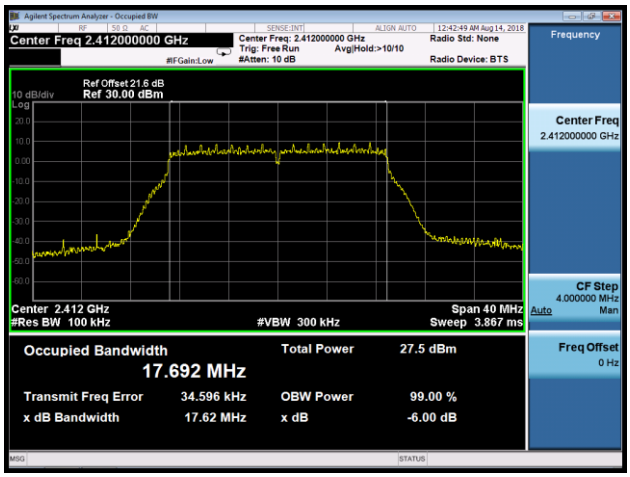
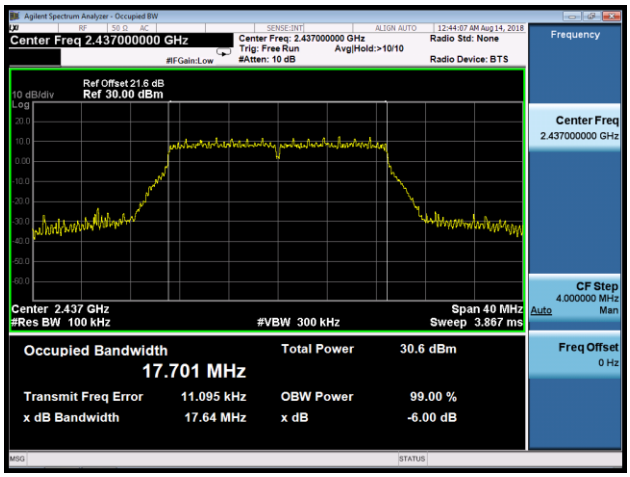
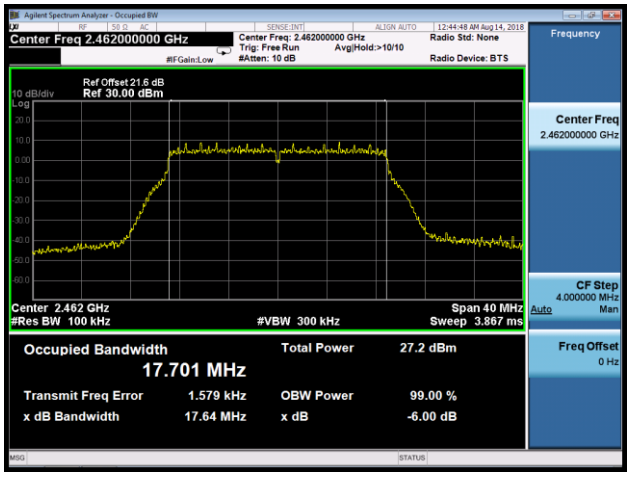
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Ant 3 / Ant 0 + 1 +2 + 3						
802.11b	1Mbps	01	2412	7.09	≥ 0.5	Pass
802.11b	1Mbps	06	2437	7.08	≥ 0.5	Pass
802.11b	1Mbps	11	2462	7.08	≥ 0.5	Pass
802.11g	6Mbps	01	2412	16.39	≥ 0.5	Pass
802.11g	6Mbps	06	2437	16.39	≥ 0.5	Pass
802.11g	6Mbps	11	2462	16.40	≥ 0.5	Pass
802.11n-HT20	MCS0	01	2412	17.61	≥ 0.5	Pass
802.11n-HT20	MCS0	06	2437	17.63	≥ 0.5	Pass
802.11n-HT20	MCS0	11	2462	17.63	≥ 0.5	Pass
802.11n-HT40	MCS0	03	2422	35.97	≥ 0.5	Pass
802.11n-HT40	MCS0	06	2437	36.37	≥ 0.5	Pass
802.11n-HT40	MCS0	09	2452	36.38	≥ 0.5	Pass
802.11ac-VHT20	MCS0	01	2412	17.62	≥ 0.5	Pass
802.11ac-VHT20	MCS0	06	2437	17.64	≥ 0.5	Pass
802.11ac-VHT20	MCS0	11	2462	17.64	≥ 0.5	Pass
802.11ac-VHT40	MCS0	03	2422	36.36	≥ 0.5	Pass
802.11ac-VHT40	MCS0	06	2437	36.40	≥ 0.5	Pass
802.11ac-VHT40	MCS0	09	2452	36.41	≥ 0.5	Pass
802.11ax-HE20	MCS0	01	2412	19.07	≥ 0.5	Pass
802.11ax-HE20	MCS0	06	2437	18.97	≥ 0.5	Pass
802.11ax-HE20	MCS0	11	2462	17.63	≥ 0.5	Pass
802.11ax-HE40	MCS0	03	2422	37.32	≥ 0.5	Pass
802.11ax-HE40	MCS0	06	2437	37.53	≥ 0.5	Pass
802.11ax-HE40	MCS0	09	2452	37.55	≥ 0.5	Pass

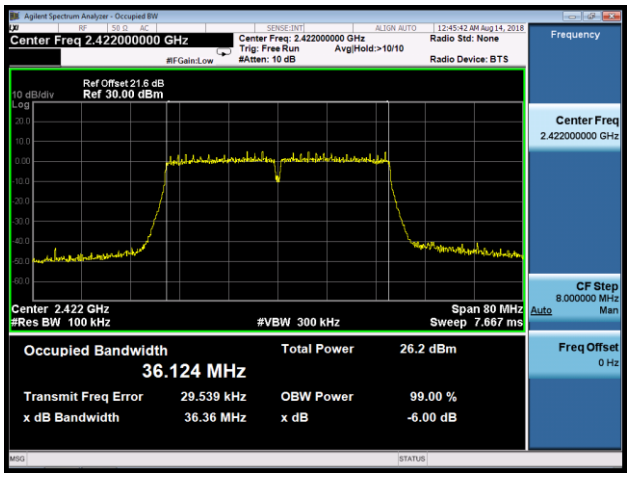
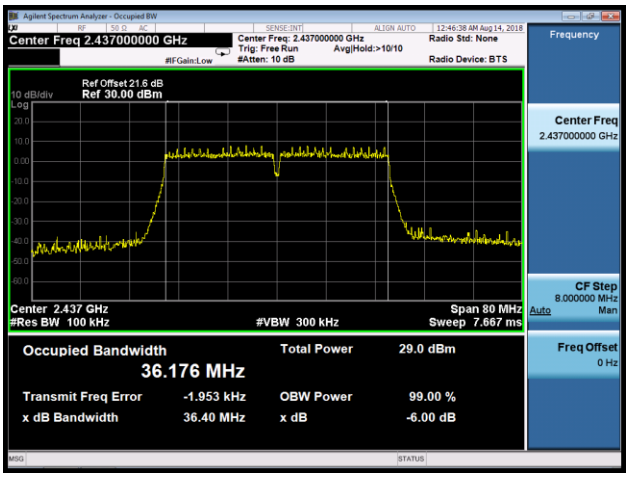
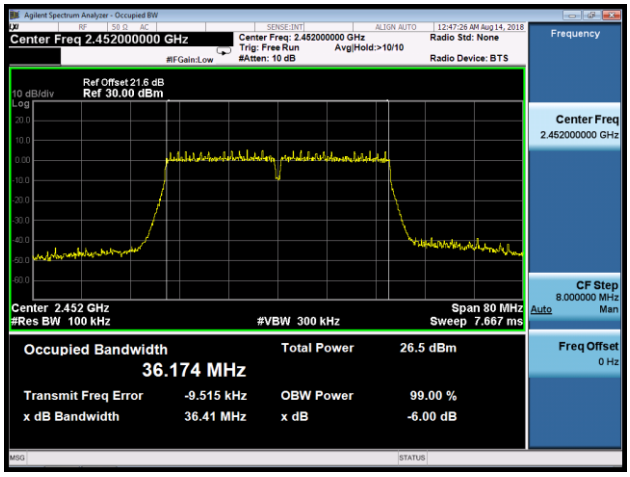
802.11b 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

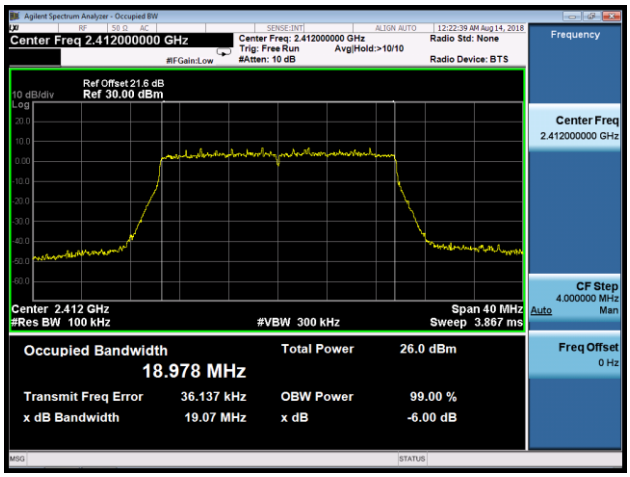
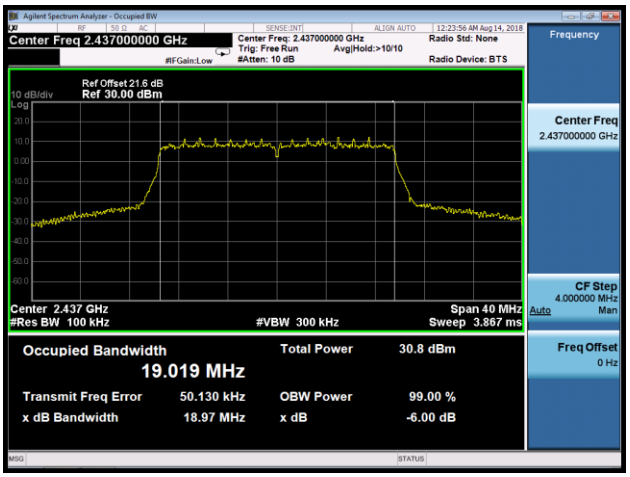
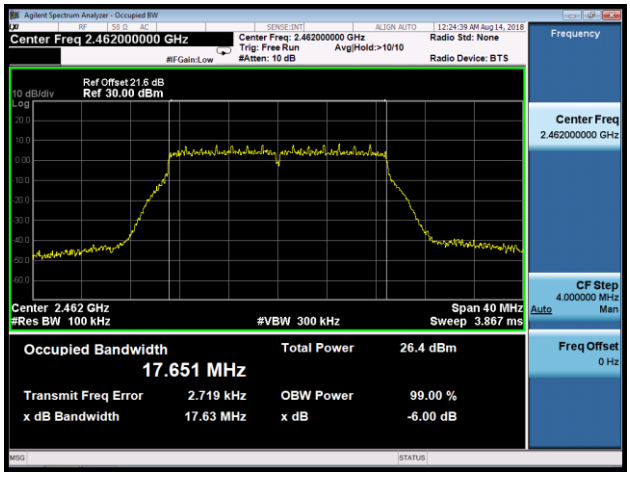
802.11g 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

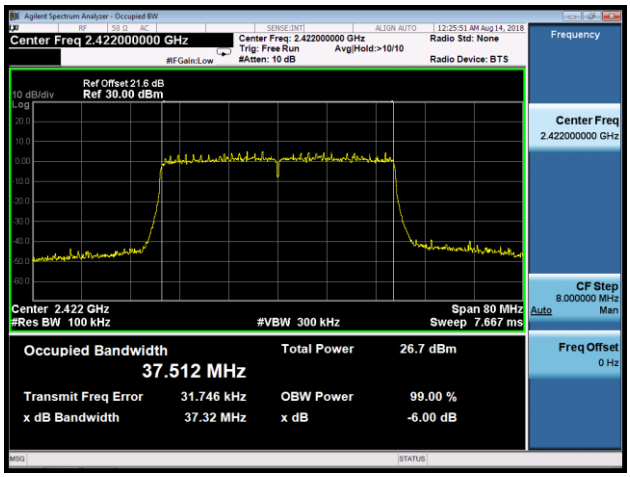
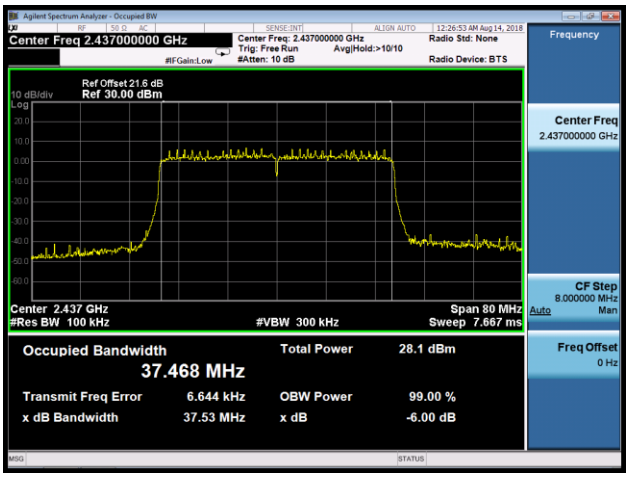
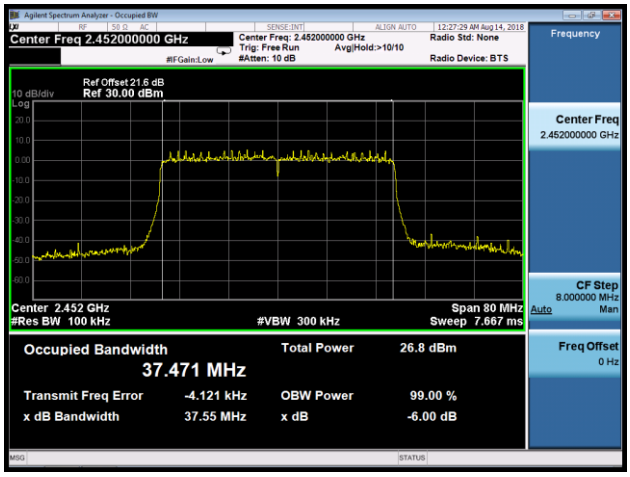
802.11n-HT20 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT40 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11ac-VHT20 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11ac-VHT40 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11ax-HE20 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11ax-HE40 6dB Bandwidth - Ant 3 / Ant 0 + 1 + 2 + 3	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

7.3. Output Power Measurement

7.3.1.Test Limit

The maximum output power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.3.2.Test Procedure Used

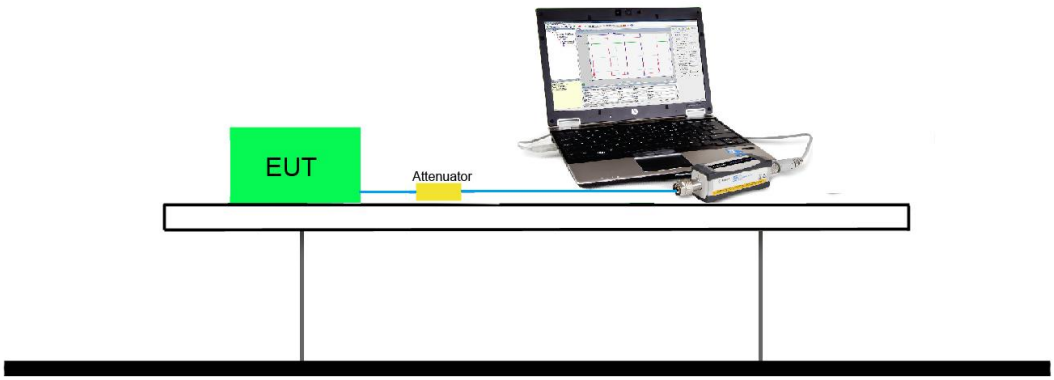
ANSI C63.10 Section 11.9.2.3

7.3.3.Test Setting

Average Power Measurement

Average power measurements were perform only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

7.3.4.Test Setup



7.3.5.29.9Test Result of Output Power

Power output test was verified over all data rates of each mode shown as below table, and then choose the maximum power output (gray marker) for final test of each channel.

For Ant 3 / Ant 0 + 1 +2 + 3 port

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate/ MCS	Average Power (dBm)
802.11b	20	6	2437	1Mbps	24.13
				5.5Mbps	24.01
				11Mbps	23.95
802.11g	20	6	2437	6Mbps	23.85
				24Mbps	23.68
				54Mbps	23.44
802.11n	20	6	2437	MCS0	24.02
				MCS3	23.89
				MCS7	23.69
802.11n	40	6	2437	MCS0	21.54
				MCS3	21.30
				MCS7	21.02
802.11ac	20	6	2437	MCS0	23.72
				MCS4	23.52
				MCS8	23.31
802.11ac	40	6	2437	MCS0	21.86
				MCS5	21.69
				MCS9	21.39
802.11ax	20	6	2437	MCS0	23.76
				MCS5	23.52
				MCS11	23.38
802.11ax	40	6	2437	MCS0	21.01
				MCS5	20.84
				MCS11	20.69

Product	AX6000 MU-MIMO Wi-Fi Router	Temperature	25°C
Test Engineer	Flag Yang	Relative Humidity	54%
Test Site	TR3	Test Date	2018/08/13
Test Item	Output Power		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Ant 2 Average Power (dBm)	Ant 3 Average Power (dBm)	Total Average Power (dBm)	Limit (dBm)	Result
CDD Mode										
802.11b	1Mbps	01	2412	23.61	24.04	23.60	24.19	29.89	≤ 30.00	Pass
802.11b	1Mbps	06	2437	23.51	23.89	23.54	24.13	29.80	≤ 30.00	Pass
802.11b	1Mbps	11	2462	23.48	24.02	23.48	24.26	29.84	≤ 30.00	Pass
802.11g	6Mbps	01	2412	21.69	21.76	21.31	21.65	27.63	≤ 30.00	Pass
802.11g	6Mbps	06	2437	23.65	23.97	23.63	23.85	29.80	≤ 30.00	Pass
802.11g	6Mbps	11	2462	20.17	20.38	19.92	20.54	26.28	≤ 30.00	Pass
802.11n-HT20	MCS0	01	2412	19.81	19.91	19.65	19.72	25.79	≤ 30.00	Pass
802.11n-HT20	MCS0	06	2437	23.86	24.12	23.74	24.02	29.96	≤ 30.00	Pass
802.11n-HT20	MCS0	11	2462	19.00	19.50	18.99	19.14	25.18	≤ 30.00	Pass
802.11n-HT40	MCS0	03	2422	18.82	19.06	18.98	19.51	25.12	≤ 30.00	Pass
802.11n-HT40	MCS0	06	2437	20.59	20.88	20.78	21.54	26.98	≤ 30.00	Pass
802.11n-HT40	MCS0	09	2452	18.11	18.41	18.35	19.10	24.53	≤ 30.00	Pass
802.11ac-VHT20	MCS0	01	2412	20.70	20.70	20.31	20.68	26.62	≤ 30.00	Pass
802.11ac-VHT20	MCS0	06	2437	23.68	23.92	23.63	23.72	29.76	≤ 30.00	Pass
802.11ac-VHT20	MCS0	11	2462	20.65	20.65	20.28	20.78	26.61	≤ 30.00	Pass
802.11ac-VHT40	MCS0	03	2422	18.47	18.63	18.52	19.11	24.71	≤ 30.00	Pass
802.11ac-VHT40	MCS0	06	2437	21.46	21.47	21.52	21.86	27.60	≤ 30.00	Pass
802.11ac-VHT40	MCS0	09	2452	18.87	19.03	18.92	19.54	25.12	≤ 30.00	Pass
802.11ax-HE20	MCS0	01	2412	19.02	19.22	18.77	19.21	25.08	≤ 30.00	Pass
802.11ax-HE20	MCS0	06	2437	23.70	24.05	23.72	23.76	29.83	≤ 30.00	Pass
802.11ax-HE20	MCS0	11	2462	19.99	20.15	19.86	19.91	26.00	≤ 30.00	Pass
802.11ax-HE40	MCS0	03	2422	18.43	18.83	18.63	19.56	24.90	≤ 30.00	Pass
802.11ax-HE40	MCS0	06	2437	20.17	20.55	20.22	21.01	26.52	≤ 30.00	Pass
802.11ax-HE40	MCS0	09	2452	19.13	19.20	19.04	19.70	25.30	≤ 30.00	Pass

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Ant 2 Average Power (dBm)	Ant 3 Average Power (dBm)	Total Average Power (dBm)	Limit (dBm)	Result
Beam-Forming Mode										
802.11ac-VHT20	MCS0	01	2412	19.68	19.52	19.36	19.72	25.59	≤ 28.82	Pass
802.11ac-VHT20	MCS0	06	2437	22.59	22.81	22.56	22.48	28.63	≤ 28.82	Pass
802.11ac-VHT20	MCS0	11	2462	19.40	19.73	19.45	19.55	25.55	≤ 28.82	Pass
802.11ac-VHT40	MCS0	03	2422	22.46	22.85	22.78	23.02	28.80	≤ 28.82	Pass
802.11ac-VHT40	MCS0	06	2437	20.54	20.87	20.52	21.22	26.82	≤ 28.82	Pass
802.11ac-VHT40	MCS0	09	2452	20.43	20.61	20.88	21.34	26.85	≤ 28.82	Pass
802.11ax-HE20	MCS0	01	2412	18.64	18.88	18.47	18.36	24.61	≤ 28.82	Pass
802.11ax-HE20	MCS0	06	2437	22.56	22.85	22.65	23.04	28.80	≤ 28.82	Pass
802.11ax-HE20	MCS0	11	2462	17.56	17.83	17.63	17.70	23.70	≤ 28.82	Pass
802.11ax-HE40	MCS0	03	2422	20.25	20.57	20.61	21.22	26.70	≤ 28.82	Pass
802.11ax-HE40	MCS0	06	2437	20.47	21.12	20.92	21.61	27.07	≤ 28.82	Pass
802.11ax-HE40	MCS0	09	2452	21.48	21.47	21.81	22.05	27.73	≤ 28.82	Pass

Note 1: Total Average Power (dBm) = $10*\log\{10^{(\text{Ant 0 Average Power }/10)} + 10^{(\text{Ant 1 Average Power }/10)} + 10^{(\text{Ant 2 Average Power }/10)} + 10^{(\text{Ant 3 Average Power }/10)}\}$ (dBm).

Note 2: For CDD Mode, Average Power Limit (dBm) = 30dBm

For Beam-Forming Mode, Average Power Limit (dBm) = 30 dBm - (7.18 dBi – 6 dBi) = 28.82dBm.

7.4. Power Spectral Density Measurement

7.4.1.Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

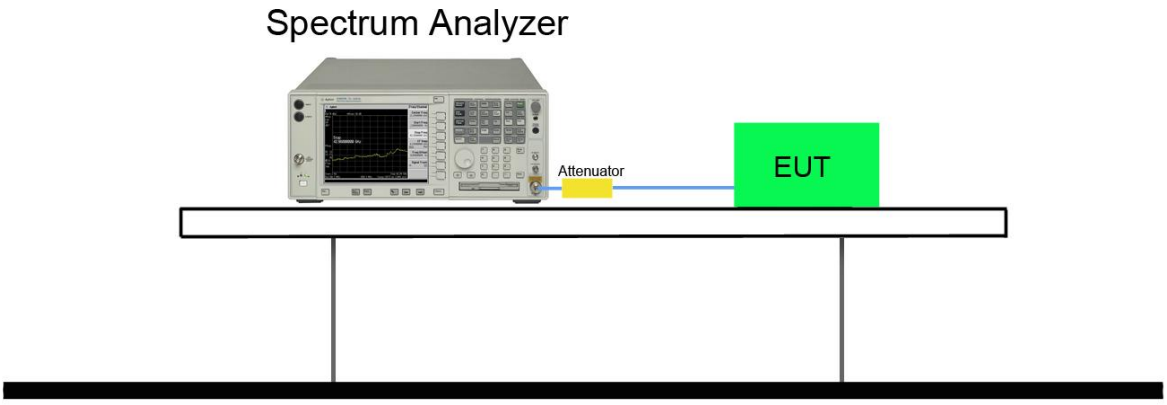
7.4.2.Test Procedure Used

ANSI C63.10 Section 11.10.5

7.4.3.Test Setting

1. Measure the duty cycle (x) of the transmitter output signal.
2. Set instrument center frequency to DTS channel center frequency.
3. Set span to at least 1.5 times the OBW.
4. RBW = 10 kHz.
5. VBW = 30 kHz.
6. Detector = RMS.
7. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
8. Sweep time = auto couple.
9. Don’t use sweep triggering. Allow sweep to “free run”.
10. Employ trace averaging (RMS) mode over a minimum of 100 traces.
11. Use the peak marker function to determine the maximum amplitude level.
12. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.
13. Add Constant Factor = 10*log(3kHz / 10kHz) = -5.23.

7.4.4.Test Setup



7.4.5.Test Result

Product	AX6000 MU-MIMO Wi-Fi Router	Temperature	25°C
Test Engineer	Flag Yang	Relative Humidity	54%
Test Site	TR3	Test Date	2018/08/14
Test Item	Power Spectral Density		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/ 10kHz)	Ant 1 PSD (dBm/ 10kHz)	Ant 2 PSD (dBm/ 10kHz)	Ant 3 PSD (dBm/ 10kHz)	Duty Cycle (%)	Constant Factor (dBm)	Total PSD (dBm/ 3kHz)	Limit (dBm/ 3kHz)	Result
CDD Mode												
802.11b	1Mbps	01	2412	-1.96	-1.35	-1.86	-1.63	94.87	-5.23	-0.67	≤ 6.82	Pass
802.11b	1Mbps	06	2437	-1.89	-1.54	-1.62	-1.46	94.87	-5.23	-0.61	≤ 6.82	Pass
802.11b	1Mbps	11	2462	-1.83	-1.01	-1.89	-1.37	94.87	-5.23	-0.49	≤ 6.82	Pass
802.11g	6Mbps	01	2412	-6.84	-7.29	-7.35	-7.03	91.02	-5.23	-5.92	≤ 6.82	Pass
802.11g	6Mbps	06	2437	-3.10	-3.91	-4.90	-4.65	91.02	-5.23	-2.88	≤ 6.82	Pass
802.11g	6Mbps	11	2462	-6.56	-7.87	-7.89	-7.86	91.02	-5.23	-6.31	≤ 6.82	Pass
802.11n-HT20	MCS0	01	2412	-6.46	-8.36	-7.63	-9.21	94.91	-5.23	-6.78	≤ 6.82	Pass
802.11n-HT20	MCS0	06	2437	-1.76	-4.30	-3.72	-4.72	94.91	-5.23	-2.45	≤ 6.82	Pass
802.11n-HT20	MCS0	11	2462	-5.66	-8.09	-8.29	-9.46	94.91	-5.23	-6.62	≤ 6.82	Pass
802.11n-HT40	MCS0	03	2422	-12.09	-11.64	-11.83	-10.81	91.10	-5.23	-10.37	≤ 6.82	Pass
802.11n-HT40	MCS0	06	2437	-9.85	-9.43	-9.83	-9.11	91.10	-5.23	-8.35	≤ 6.82	Pass
802.11n-HT40	MCS0	09	2452	-11.89	-12.31	-12.21	-11.51	91.10	-5.23	-10.77	≤ 6.82	Pass
802.11ac-VHT20	MCS0	01	2412	-4.49	-7.60	-5.90	-7.39	98.06	-5.23	-5.37	≤ 6.82	Pass
802.11ac-VHT20	MCS0	06	2437	-4.04	-4.75	-4.21	-4.45	98.06	-5.23	-3.56	≤ 6.82	Pass
802.11ac-VHT20	MCS0	11	2462	-6.74	-7.41	-7.36	-7.71	98.06	-5.23	-6.50	≤ 6.82	Pass
802.11ac-VHT40	MCS0	03	2422	-13.32	-13.18	-12.47	-12.39	96.97	-5.23	-11.90	≤ 6.82	Pass
802.11ac-VHT40	MCS0	06	2437	-9.48	-9.08	-9.15	-8.83	96.97	-5.23	-8.20	≤ 6.82	Pass
802.11ac-VHT40	MCS0	09	2452	-11.53	-10.86	-11.18	-10.96	96.97	-5.23	-10.20	≤ 6.82	Pass
802.11ax-HE20	MCS0	01	2412	-8.35	-10.24	-9.39	-10.36	97.69	-5.23	-8.62	≤ 6.82	Pass
802.11ax-HE20	MCS0	06	2437	-3.50	-4.81	-4.74	-4.74	97.69	-5.23	-3.52	≤ 6.82	Pass
802.11ax-HE20	MCS0	11	2462	-5.23	-8.16	-7.35	-8.97	97.69	-5.23	-6.30	≤ 6.82	Pass
802.11ax-HE40	MCS0	03	2422	-13.92	-13.59	-13.36	-13.13	95.61	-5.23	-12.50	≤ 6.82	Pass
802.11ax-HE40	MCS0	06	2437	-10.82	-10.94	-10.67	-10.42	95.61	-5.23	-9.72	≤ 6.82	Pass
802.11ax-HE40	MCS0	09	2452	-12.52	-12.32	-12.37	-12.11	95.61	-5.23	-11.34	≤ 6.82	Pass

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/ 10kHz)	Ant 1 PSD (dBm/ 10kHz)	Ant 2 PSD (dBm/ 10kHz)	Ant 3 PSD (dBm/ 10kHz)	Duty Cycle (%)	Constant Factor (dBm)	Total PSD (dBm/ 3kHz)	Limit (dBm/ 3kHz)	Result
Beam-Forming Mode												
802.11ac-VHT20	MCS0	01	2412	-5.75	-7.47	-7.17	-8.37	98.06	-5.23	-6.29	≤ 6.82	Pass
802.11ac-VHT20	MCS0	06	2437	-4.22	-4.52	-4.89	-5.10	98.06	-5.23	-3.88	≤ 6.82	Pass
802.11ac-VHT20	MCS0	11	2462	-5.66	-7.04	-7.38	-7.65	98.06	-5.23	-6.07	≤ 6.82	Pass
802.11ac-VHT40	MCS0	03	2422	-7.26	-6.78	-7.02	-6.15	96.97	-5.23	-5.86	≤ 6.82	Pass
802.11ac-VHT40	MCS0	06	2437	-9.05	-9.03	-8.58	-8.47	96.97	-5.23	-7.85	≤ 6.82	Pass
802.11ac-VHT40	MCS0	09	2452	-7.82	-9.14	-8.93	-8.55	96.97	-5.23	-7.66	≤ 6.82	Pass
802.11ax-HE20	MCS0	01	2412	-7.34	-8.24	-9.05	-9.76	97.69	-5.23	-7.61	≤ 6.82	Pass
802.11ax-HE20	MCS0	06	2437	-4.24	-4.40	-4.88	-4.34	97.69	-5.23	-3.57	≤ 6.82	Pass
802.11ax-HE20	MCS0	11	2462	-8.43	-10.12	-9.30	-10.14	97.69	-5.23	-8.55	≤ 6.82	Pass
802.11ax-HE40	MCS0	03	2422	-10.21	-9.73	-9.63	-8.69	95.61	-5.23	-8.54	≤ 6.82	Pass
802.11ax-HE40	MCS0	06	2437	-8.77	-9.42	-9.10	-8.75	95.61	-5.23	-8.02	≤ 6.82	Pass
802.11ax-HE40	MCS0	09	2452	-7.42	-7.13	-7.51	-6.75	95.61	-5.23	-6.21	≤ 6.82	Pass

Note 1: When EUT duty cycle ≥ 98%, Total AVGPSD = 10*log $\{10^{(\text{Ant 0 AVGPSD}/10)} + 10^{(\text{Ant 1 AVGPSD}/10)}\}$ + Constant Factor.

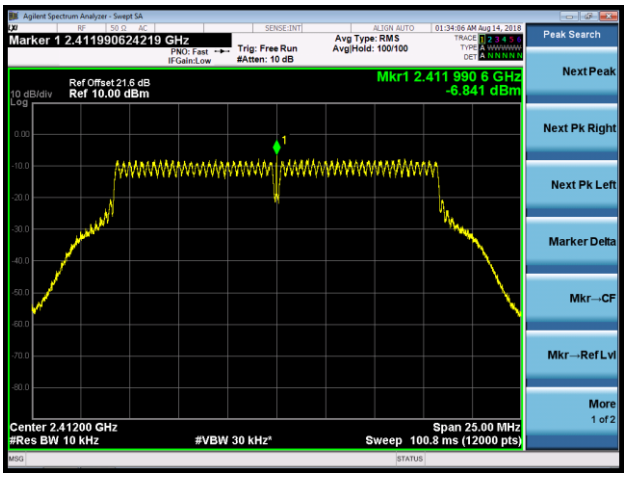
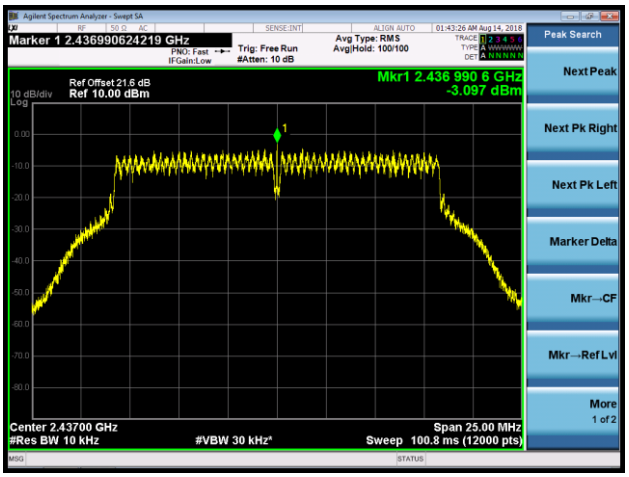
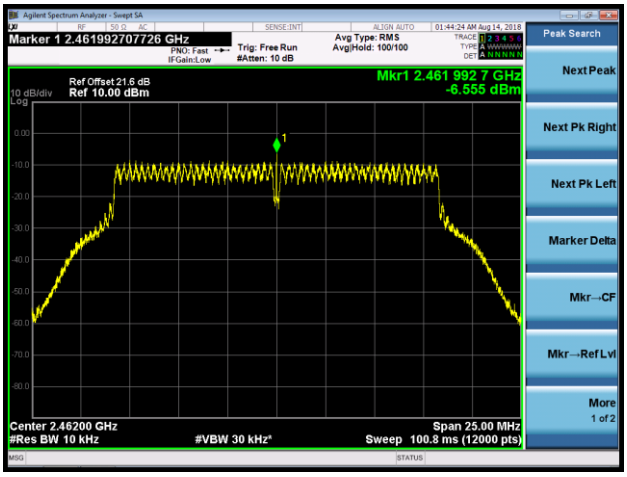
Note 2: When EUT duty cycle < 98%, Total AVGPSD = 10*log $\{10^{(\text{Ant 0 AVGPSD}/10)} + 10^{(\text{Ant 1 AVGPSD}/10)}\}$ + 10*log (1/duty cycle) + Constant Factor.

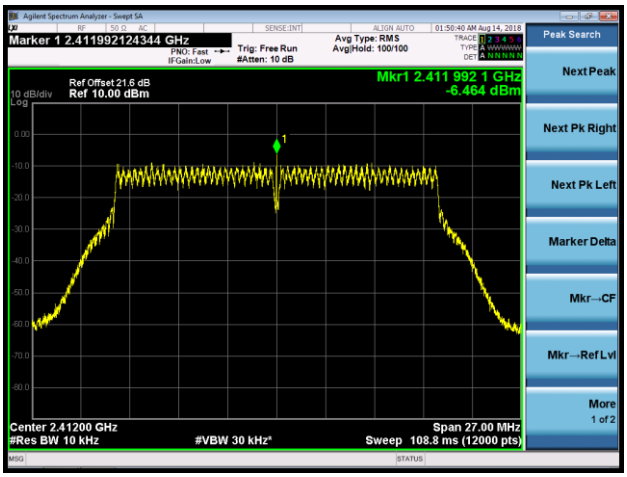
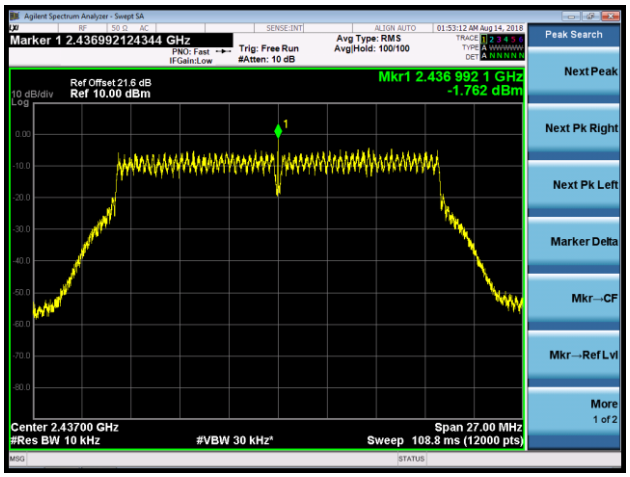
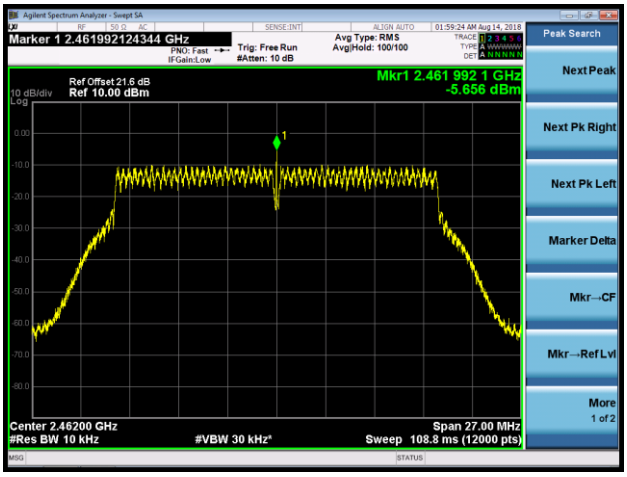
Note 3: For CDD Mode, PSD Limit = 8 dBm/3kHz - (7.18 dBi - 6.00 dBi) = 6.82 dBm/3kHz

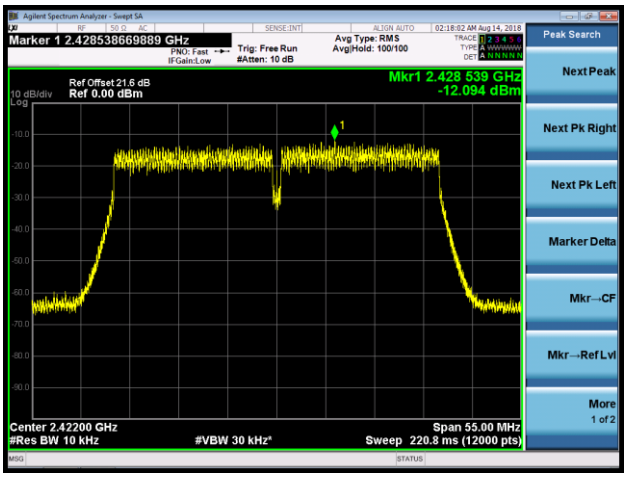
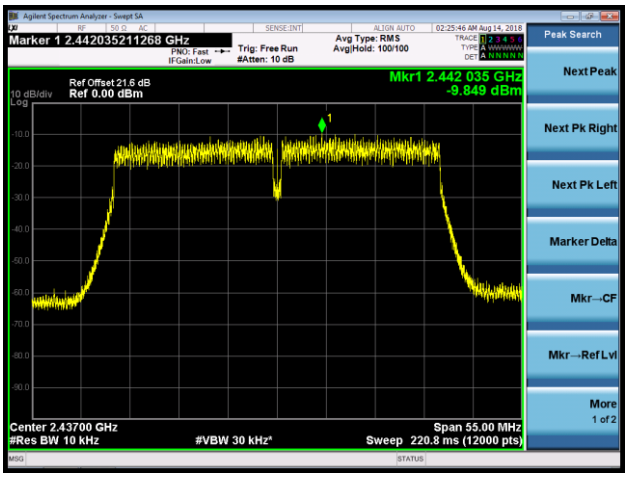
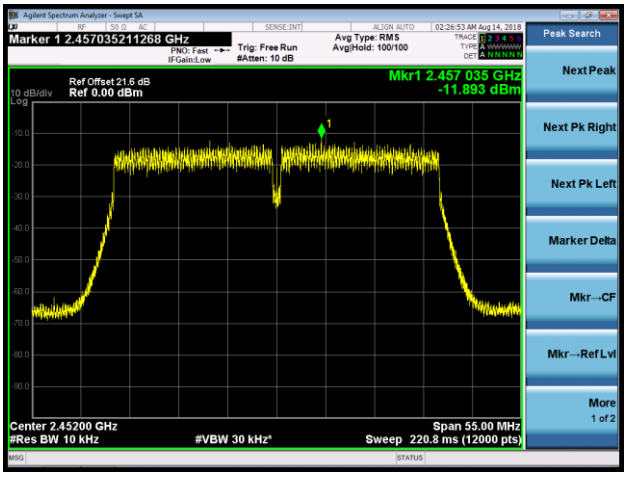
For Beam-Forming Mode, PSD Limit = 8 dBm/3kHz - (7.18 dBi - 6.00 dBi) = 6.82 dBm/3kHz.

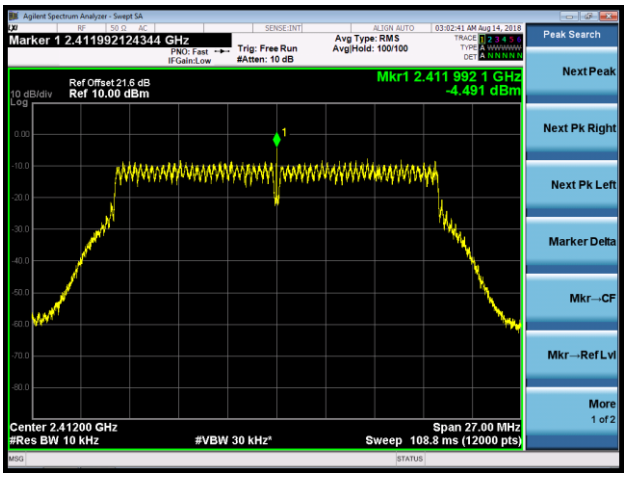
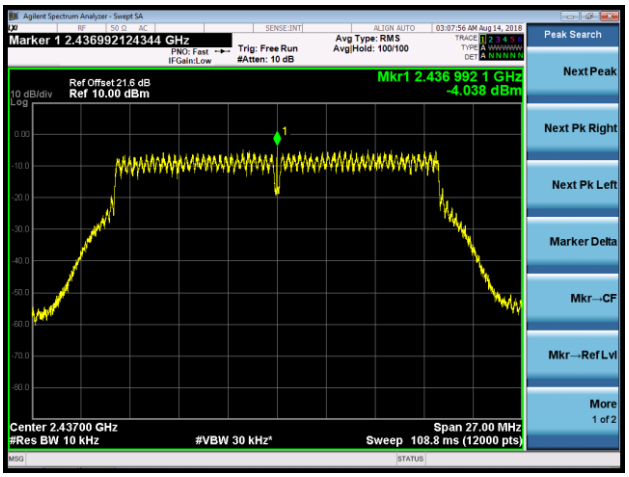
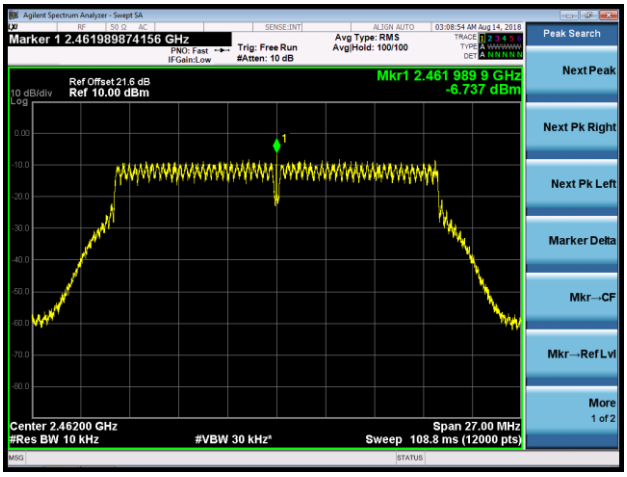
Product	AX6000 MU-MIMO Wi-Fi Router	Temperature	25°C
Test Engineer	Flag Yang	Relative Humidity	54%
Test Mode	CDD Mode		

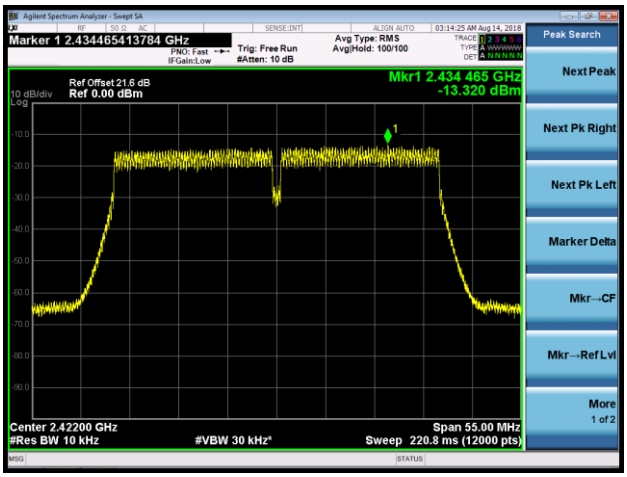
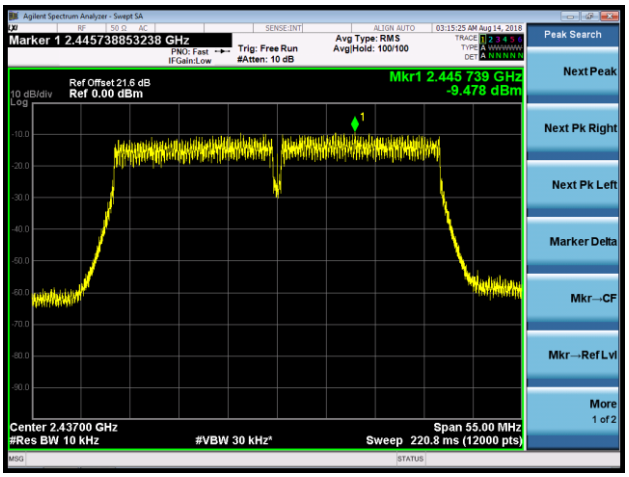
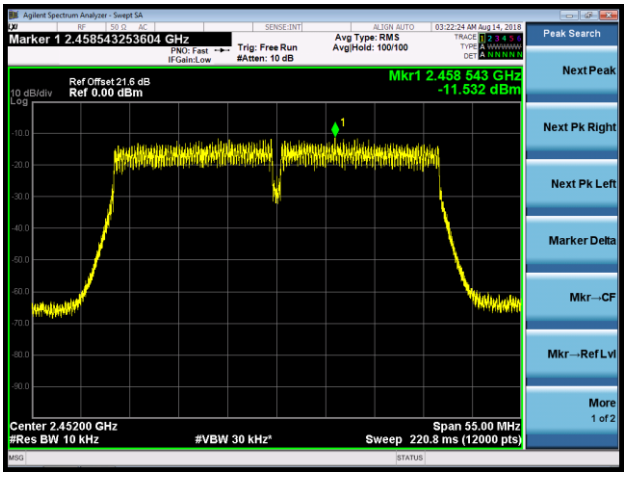
802.11b AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

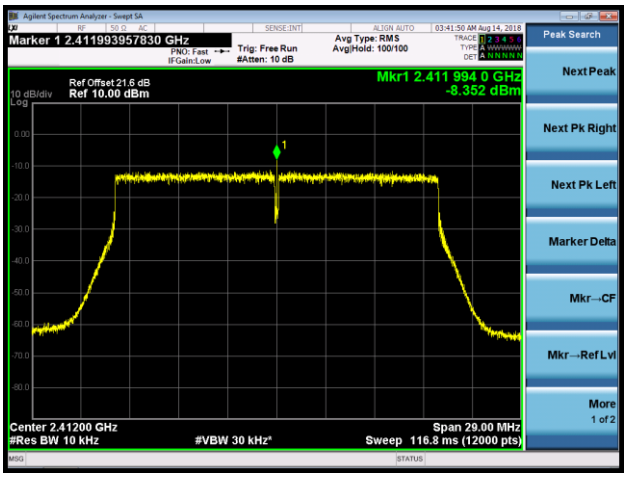
802.11g AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT20 AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT40 AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11ac-VHT20 AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11ac-VHT40 AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11ax-HE20 AVGPSD - Ant 0 / Ant 0 + 1 +2 + 3	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)