MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID:	TK4MMN344VX
APPLICANT:	Compex Systems Pte Ltd

Application Type:	Certification
Product:	WIRELESS ACCESS POINT
Model No.:	MMN344LV-A
Brand Name:	COMPEX
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part 15.407
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02v01r04, KDB 662911 D01v02r01, KDB 644545 D03v01
Test Date:	March 16, 2015 ~ August 30, 2017

Reviewed By : Jame Yuan
(Jame Yuan)

Approved By : Marlin Chen
(Marlin Chen)

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 KDB 789033 D02v01r04. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1707RSU02703	Rev. 01	Initial report	08-10-2017	Invalid
1707RSU02703	Rev. 02	Revised some test data	09-08-2017	Valid

Note: The device integrated one wireless module that has got FCC grant (FCC ID: TK4WLE600VX), due to using the same power setting and antenna, so the most test data was refer to original report data (MRT report no: 1503RSU02902). Besides the radiated emission below 1GHz and conducted emission were re-testing again, any others were same as before.

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Description Page

§2.1033 General Information

Applicant:	Compex Systems Pte Ltd
Applicant Address:	No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651
Manufacturer:	Compex Systems Pte Ltd
Manufacturer Address:	No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part 15.407
Model No.:	MMN344LV-A
FCC ID:	TK4MMN344VX
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. 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.**

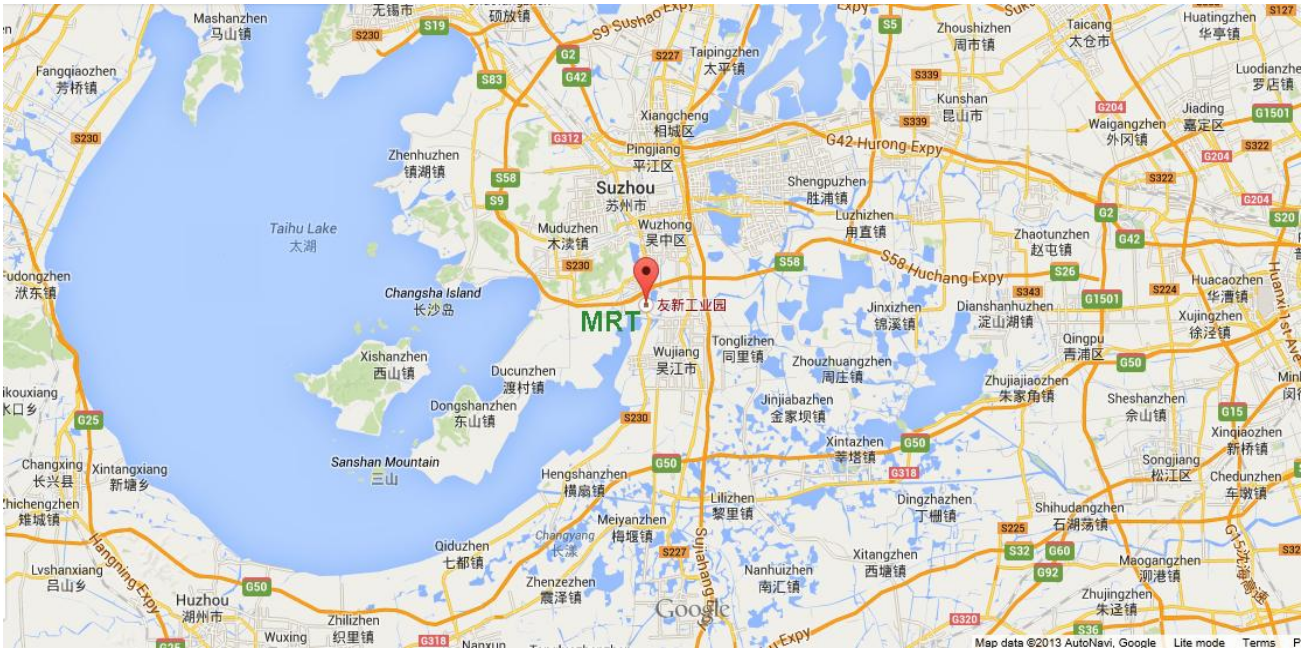
1. INTRODUCTION

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 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:	WIRELESS ACCESS POINT
Model No.:	MMN344LV-A
Brand Name:	COMPEX
Wi-Fi Specification:	802.11a/b/g/n/ac

2.2. Product Specification Subjective to this Report

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
Type of Modulation:	802.11a/n/ac: OFDM
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.6Mbps
Maximum Average Output Power:	802.11a: 20.93dBm 802.11n-HT20: 24.09dBm 802.11n-HT40: 22.93dBm 802.11ac-VHT20: 24.63dBm 802.11ac-VHT40: 22.87dBm 802.11ac-VHT80: 19.68dBm

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

2.3. Working Frequencies for this report

802.11a/n-HT20/ac-VHT20

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

802.11n-HT40

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

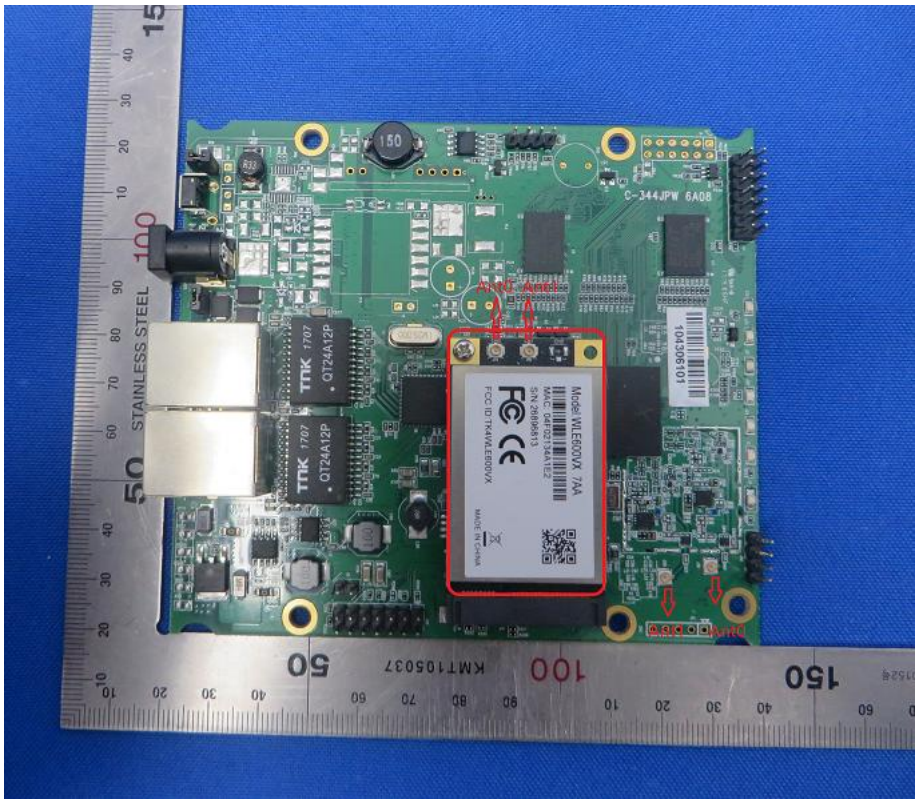
802.11ac-VHT80

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

2.4. Description of Available Antennas

Antenna Type	Frequency Band (MHz)	Max Antenna Gain (dBi)
Dipole Antenna	2412 ~ 2462	2
	5150 ~ 5825	2

2.5. Description of Antenna RF Port

Antenna RF Port


2.6. Test Mode

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

2.7. Description of Test Software

The test utility software used during testing was “QRCT”.

Power Parameter Value

Test Mode	Test Frequency	Power Parameter Value		
		Ant 0	Ant 1	Ant 0 + 1
802.11a	5180	18.0	18.0	Not Support
	5220	20.0	19.0	
	5240	20.0	19.5	
	5745	16.5	20.0	
	5785	20.0	20.0	
	5825	20.0	20.0	
802.11n-HT20	5180	18.0	17.5	17.0
	5220	20.0	20.0	17.0
	5240	20.0	20.0	16.5
	5745	16.5	17.5	18.5
	5785	20.0	20.0	20.0
	5825	19.5	20.0	20.0
802.11n-HT40	5190	15.5	16.5	15.0
	5230	20.0	20.0	18.0
	5755	16.5	18.0	16.0
	5795	20.0	20.0	20.0
802.11ac-VHT20	5180	18.0	18.5	17.0
	5220	20.0	19.5	17.0
	5240	20.0	20.0	16.5
	5745	16.5	17.5	18.0
	5785	20.0	20.0	20.0
	5825	19.5	20.0	20.0
802.11ac-VHT40	5190	15.0	16.0	14.0
	5230	20.0	20.0	18.0
	5755	16.5	17.5	16.0
	5795	20.0	20.0	20.0
802.11ac-VHT80	5210	15.0	15.0	13.5
	5775	14.0	18.0	12.0

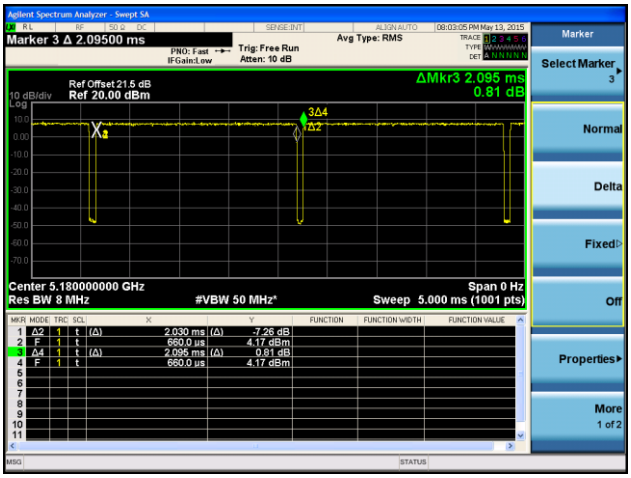
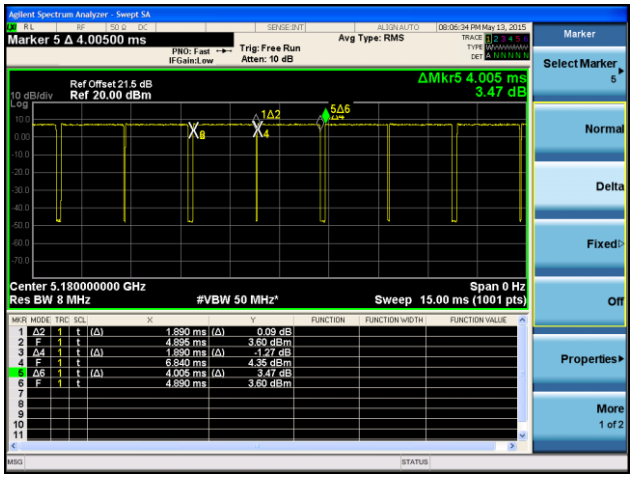
2.8. Device Capabilities

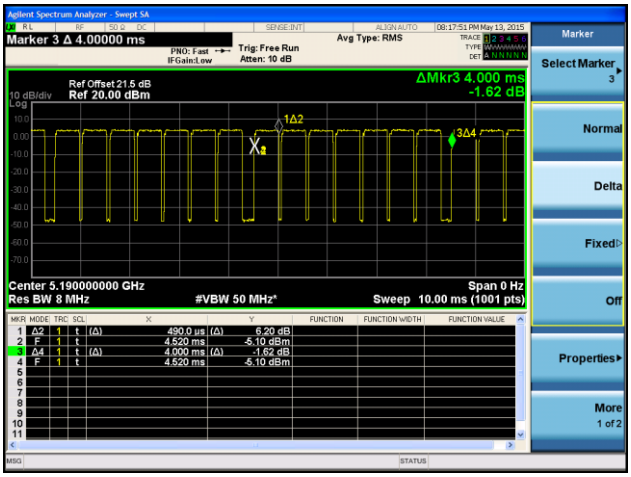
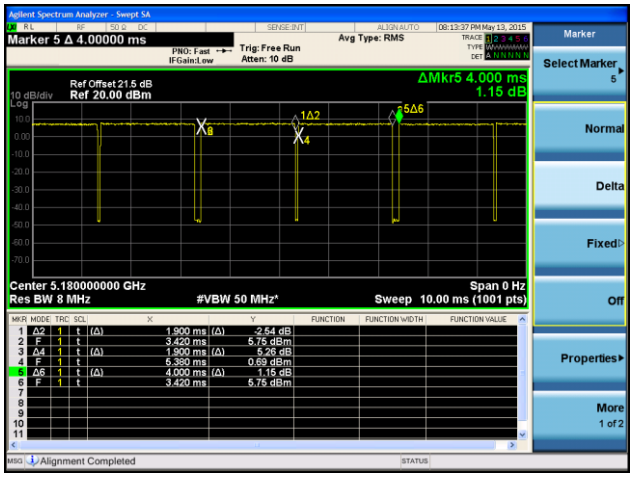
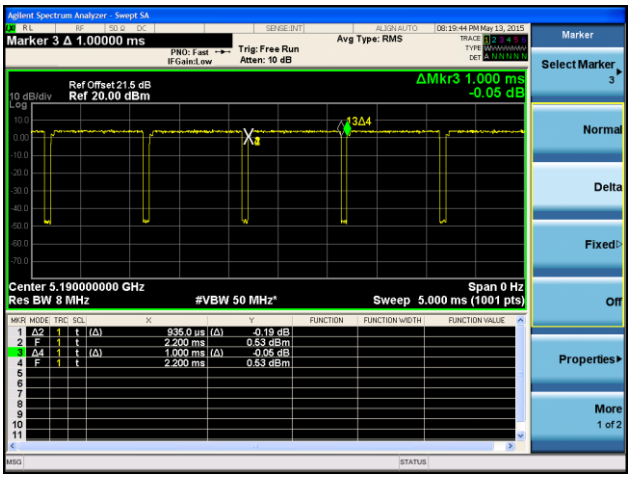
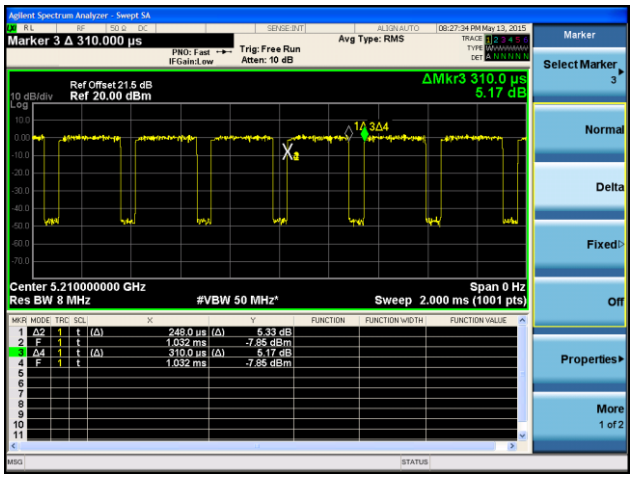
This device contains the following capabilities:

2.4GHz WLAN (DTS) and 5GHz WLAN (NII)

Note: 5GHz (NII) operation is possible in 20MHz, 40MHz and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = average per the guidance of Section B)2)b) of KDB 789033 D02v01r04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
802.11a	96.9%
802.11n-HT20	94.4%
802.11n-HT40	85.8%
802.11ac-VHT20	95.0%
802.11ac-VHT40	93.5%
802.11ac-VHT80	80.0%

802.11a	802.11n-HT20
	

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

2.9. Test Configuration

The **WIRELESS ACCESS POINT** was tested per the guidance of KDB 789033 D02v01r04. 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 provided in KDB 789033 D02v01r04 were used in the measurement of the **WIRELESS ACCESS POINT.**

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

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

Line conducted emissions test results are shown in Section 7.10.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A 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 **WIRELESS ACCESS POINT** uses a unique connector**.**

Conclusion:

The **WIRELESS ACCESS POINT** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emission - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3.6	MRTSUE06185	1 year	2018/04/25
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2018/06/21
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2018/06/21
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06181	1 year	2017/12/20
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	1 year	2018/05/09

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2015/10/09
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Preamplifier	Schwarzbeck	AP18G40	MRTSUE06121	1 year	2016/04/15
Preamplifier	Agilent	83017A	MRTSUE06019	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06048	1 year	2015/11/14

Radiated Emissions - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9038A	MRTSUE06125	1 year	2017/08/19
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2017/06/21
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2018/04/15
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2017/11/21
TRILOG Antenna	Schwarzbeck	VULB9168	MRTSUE06172	1 year	2017/11/19
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2017/11/19
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2017/12/30
Digital Thermometer & Hygrometer	Minggao	N/A	MRTSUE06170	1 year	2017/12/14
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2018/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/04/23
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2015/10/15
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/14

Software	**Version**	**Function**
e3	V 8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - 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: **WIRELESS ACCESS POINT**

FCC ID: **TK4MMN344VX**

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

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

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 7.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(ii), (3)	Maximum Conducted Output Power	≤ 30 dBm U-NII-1 ≤ 30 dBm U-NII-3		Pass	Section 7.4
15.407(a)(1)(ii), (3), (5)	Peak Power Spectral Density	≤ 17 dBm/MHz U-NII-1 ≤ 30 dBm/500kHz U-NII-3		Pass	Section 7.5
15.407(g)	Frequency Stability	N/A		Pass	Section 7.6
15.407(b)(1), (4)(i)	Undesirable Emissions	≤ -27dBm/MHz EIRP Detail see section 7.8	Radiated	Pass	Section 7.7 & 7.8
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 7.9

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) Test Items “26dB Bandwidth” & “99% Bandwidth” & “6dB Bandwidth” & “Frequency Stability” have been assessed MIMO transmission, and showed the worst single test data in this report.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

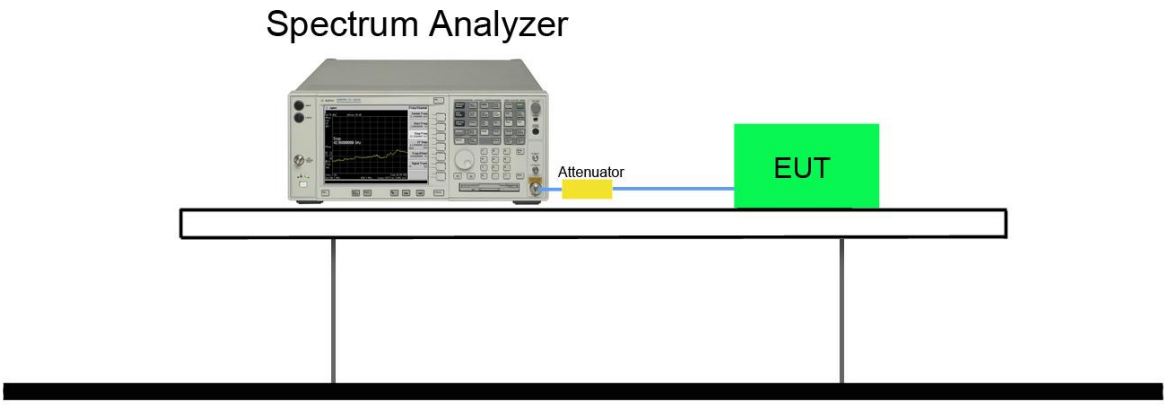
7.2.2. Test Procedure used

KDB 789033 D02v01r04 - Section C.1

7.2.3. Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4. Test Setup



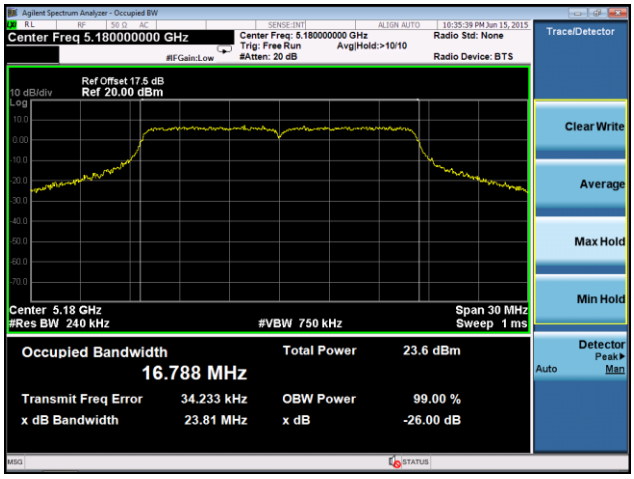
7.2.5. Test Result

Product	WIRELESS ACCESS POINT	Temperature	25°C
Test Engineer	Bruce Wang	Relative Humidity	54%
Test Site	TR3	Test Date	2015/06/15

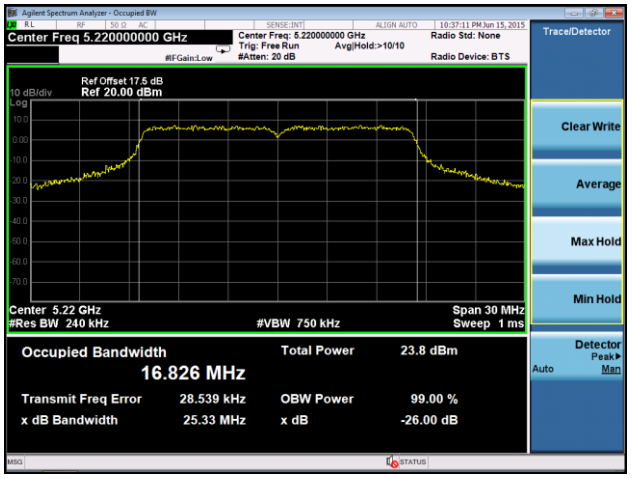
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
802.11a	6	36	5180	23.81	16.79	Pass
802.11a	6	44	5220	25.33	16.83	Pass
802.11a	6	48	5240	26.51	16.81	Pass
802.11a	6	149	5745	23.27	16.76	Pass
802.11a	6	157	5785	25.82	16.87	Pass
802.11a	6	165	5825	25.03	16.80	Pass
802.11n-HT20	6.5	36	5180	25.58	17.92	Pass
802.11n-HT20	6.5	44	5220	25.70	17.91	Pass
802.11n-HT20	6.5	48	5240	24.42	17.89	Pass
802.11n-HT20	6.5	149	5745	23.65	17.87	Pass
802.11n-HT20	6.5	157	5785	23.77	17.85	Pass
802.11n-HT20	6.5	165	5825	23.49	17.87	Pass
802.11n-HT40	13.5	38	5190	45.25	36.52	Pass
802.11n-HT40	13.5	46	5230	47.82	36.51	Pass
802.11n-HT40	13.5	151	5755	45.47	36.47	Pass
802.11n-HT40	13.5	159	5795	46.78	36.52	Pass
802.11ac-VHT20	6.5	36	5180	24.12	17.87	Pass
802.11ac-VHT20	6.5	44	5220	25.14	17.91	Pass
802.11ac-VHT20	6.5	48	5240	25.54	17.92	Pass
802.11ac-VHT20	6.5	149	5745	23.42	17.84	Pass
802.11ac-VHT20	6.5	157	5785	23.42	17.82	Pass
802.11ac-VHT20	6.5	165	5825	23.32	17.85	Pass
802.11ac-VHT40	13.5	38	5190	46.61	36.59	Pass
802.11ac-VHT40	13.5	46	5230	46.30	36.56	Pass
802.11ac-VHT40	13.5	151	5755	44.87	36.53	Pass
802.11ac-VHT40	13.5	159	5795	46.01	36.54	Pass
802.11ac-VHT80	29.3	42	5210	88.73	76.21	Pass
802.11ac-VHT80	29.3	155	5775	87.67	76.22	Pass

802.11a 26dB Bandwidth & 99% Bandwidth

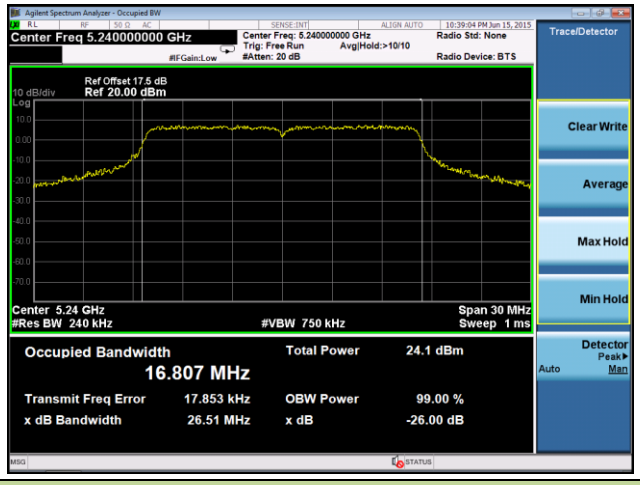
Channel 36 (5180MHz)



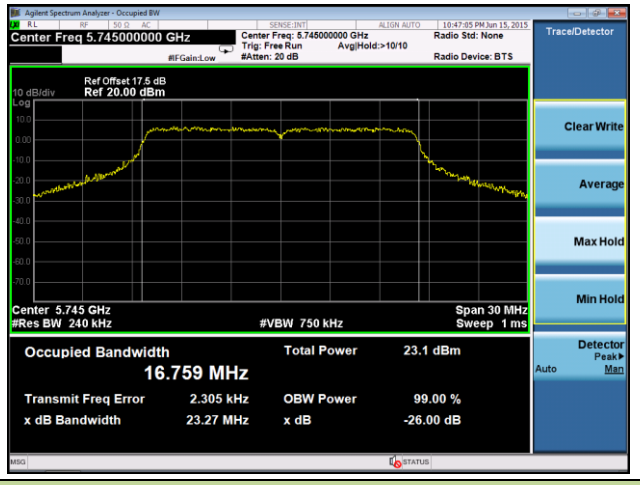
Channel 44 (5220MHz)



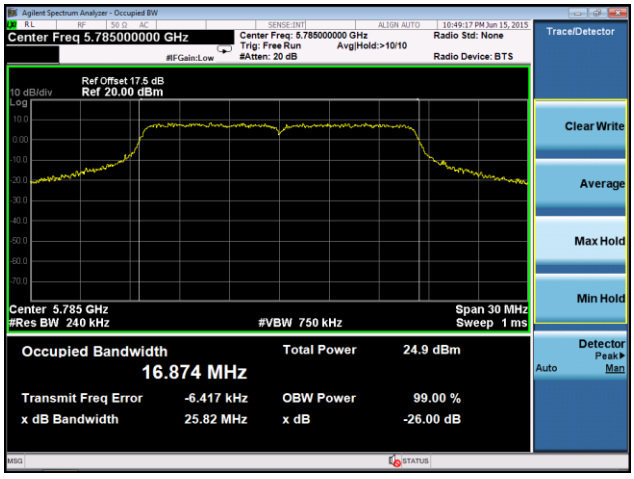
Channel 48 (5240MHz)



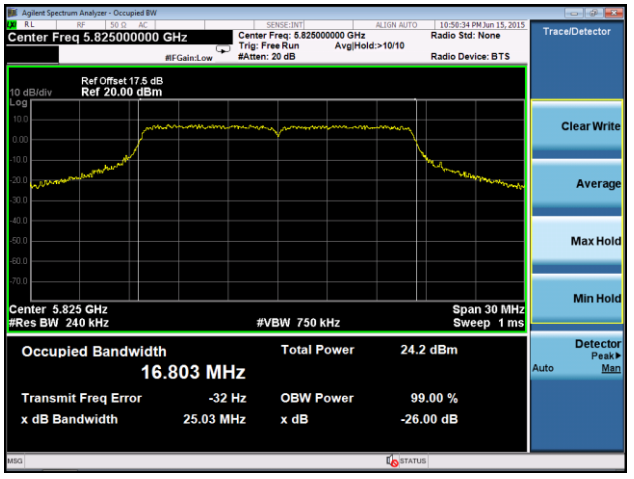
Channel 149 (5745MHz)



Channel 157 (5785MHz)

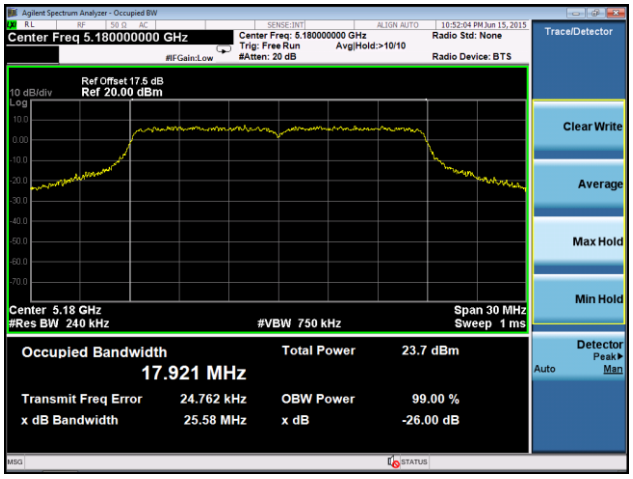


Channel 165 (5825MHz)

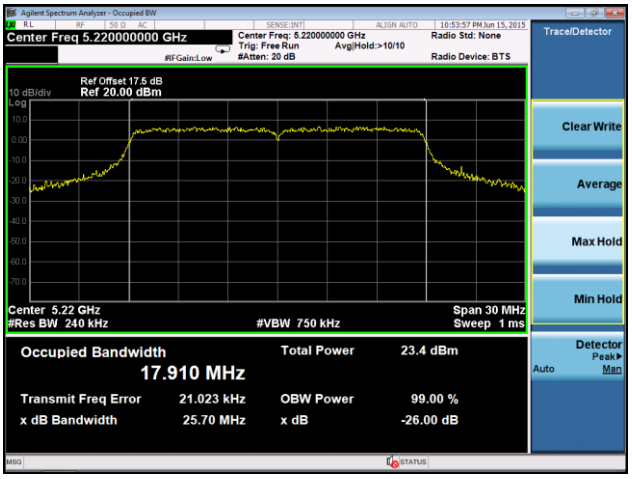


802.11n-HT20 26dB Bandwidth & 99% Bandwidth

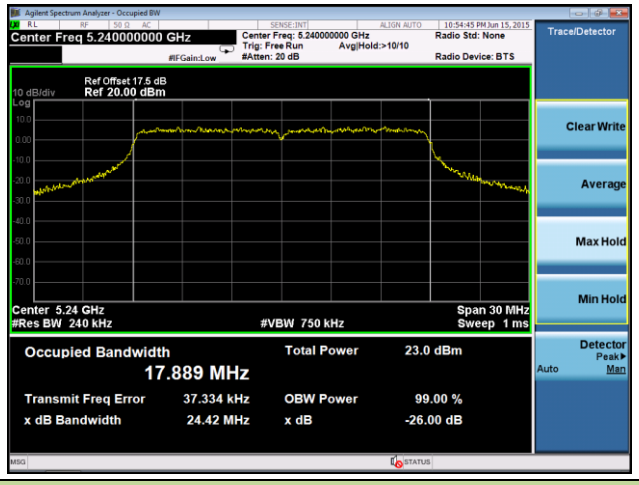
Channel 36 (5180MHz)



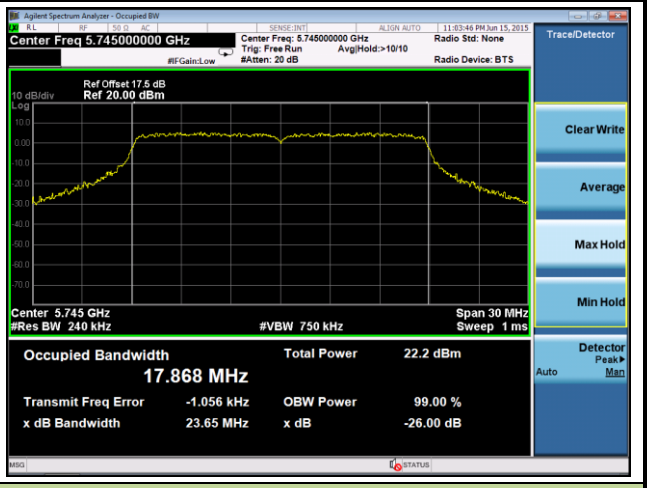
Channel 44 (5220MHz)



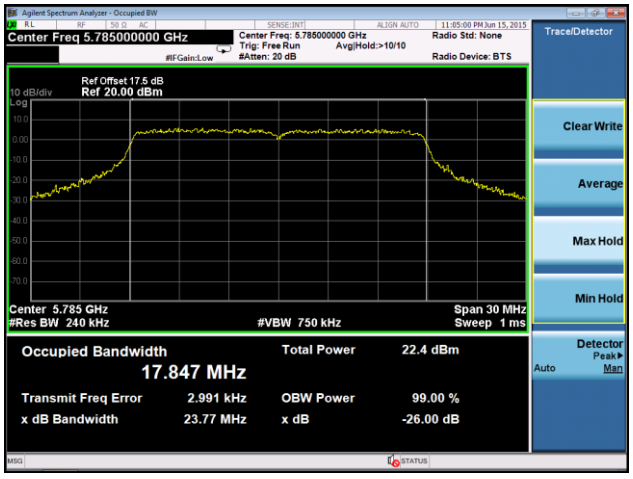
Channel 48 (5240MHz)



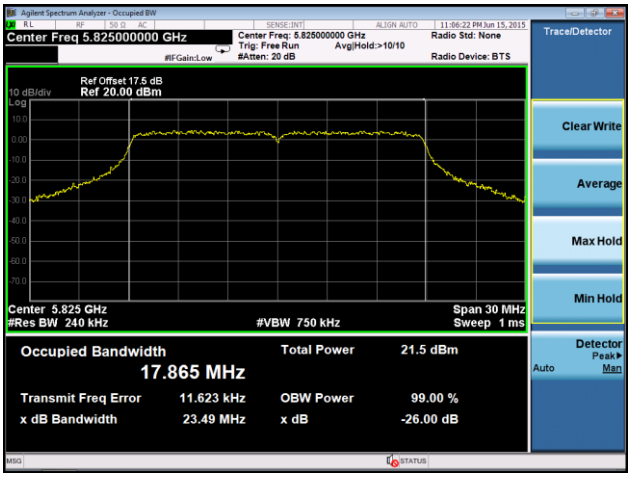
Channel 149 (5745MHz)

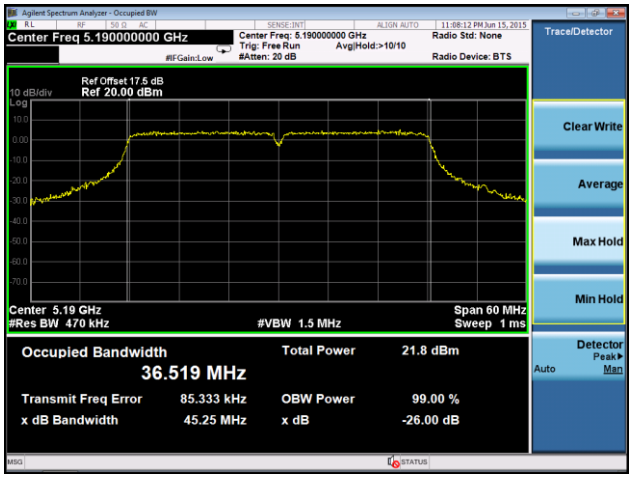
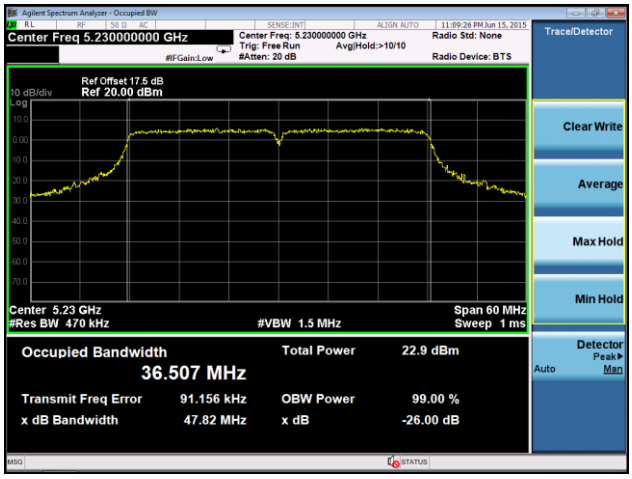
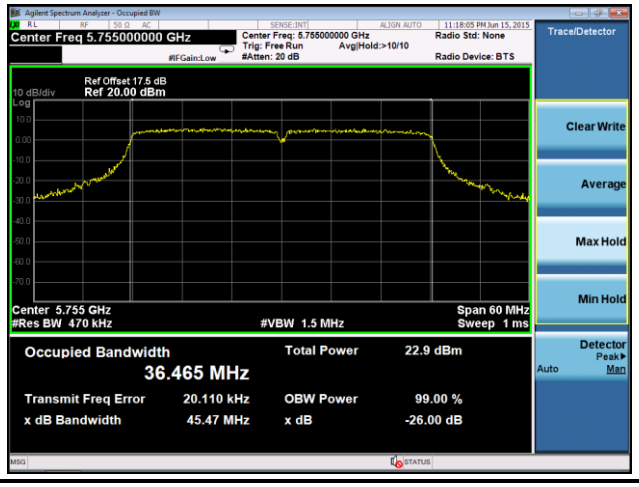
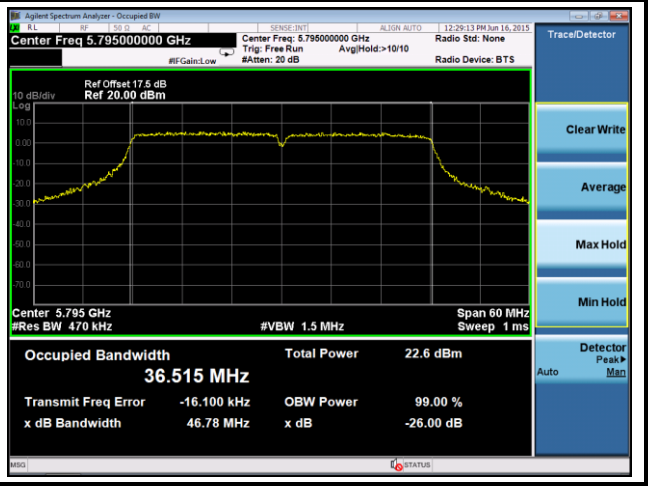


Channel 157 (5785MHz)



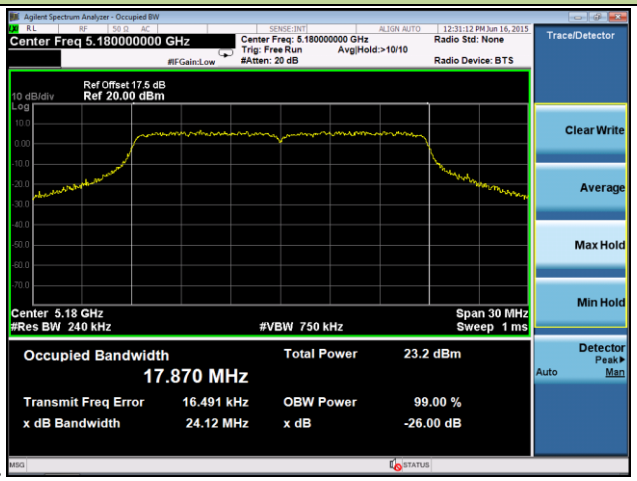
Channel 165 (5825MHz)



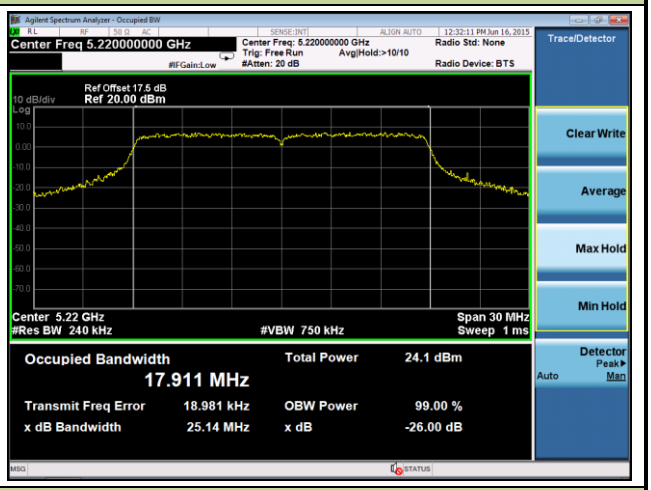
802.11n-HT40 26dB Bandwidth & 99% Bandwidth	
Channel 38 (5190MHz)	**Channel 46 (5230MHz)**
	
Channel 151 (5755MHz)	**Channel 159 (5795MHz)**
	

802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth

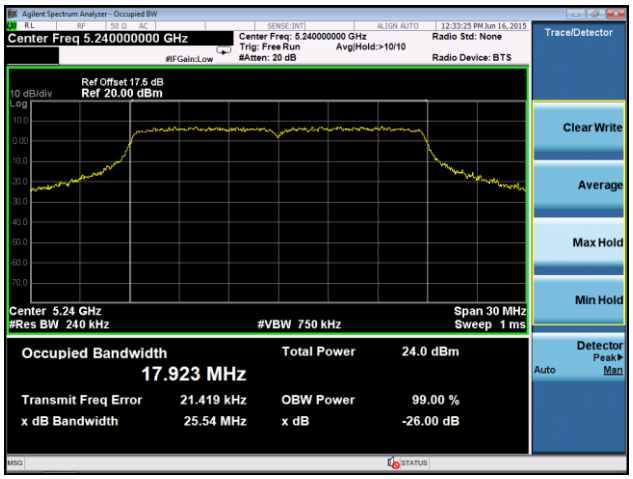
Channel 36 (5180MHz)



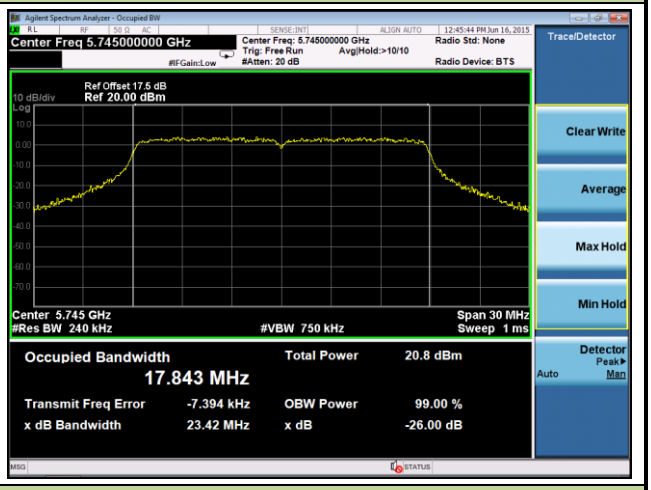
Channel 44 (5220MHz)



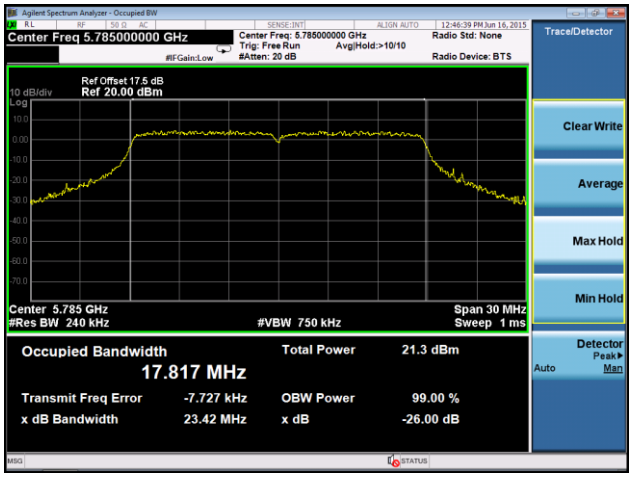
Channel 48 (5240MHz)



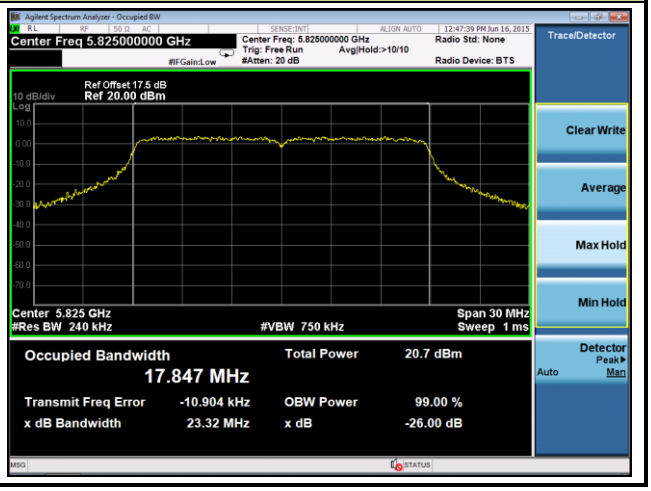
Channel 149 (5745MHz)

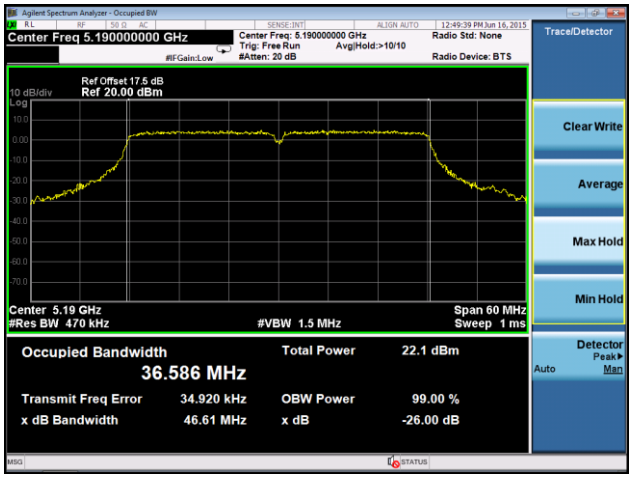
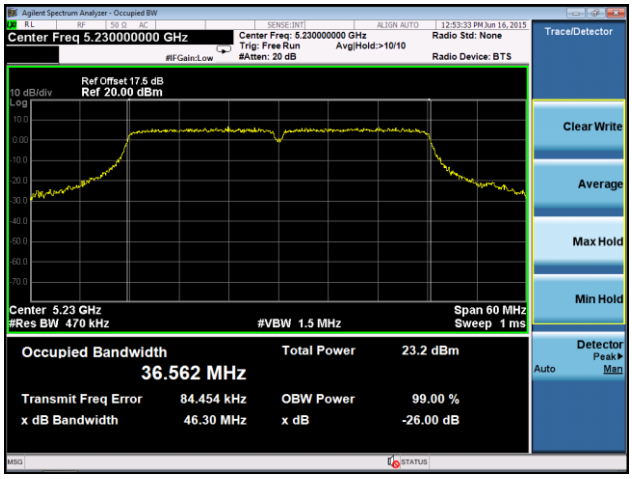
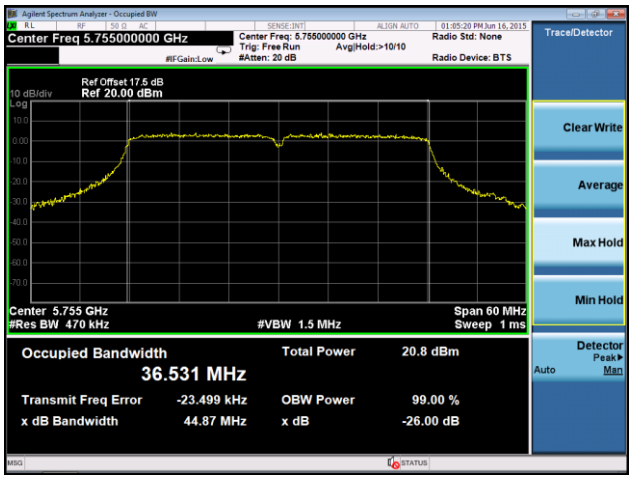
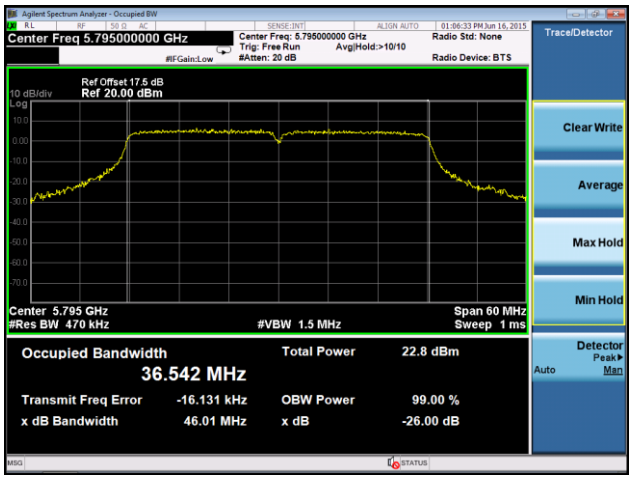
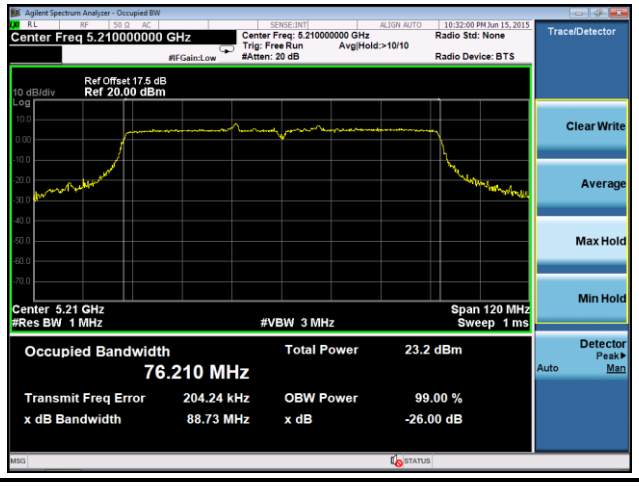
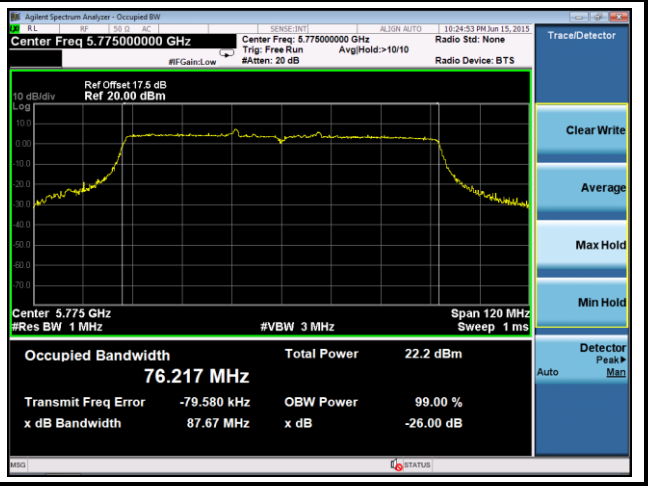


Channel 157 (5785MHz)



Channel 165 (5825MHz)



802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth	
Channel 38 (5190MHz)	Channel 46 (5230MHz)
	
Channel 151 (5755MHz)	Channel 159 (5795MHz)
	
802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth	
Channel 42 (5210MHz)	Channel 155 (5755MHz)
	

7.3. 6dB Bandwidth Measurement

7.3.1. Test Limit

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

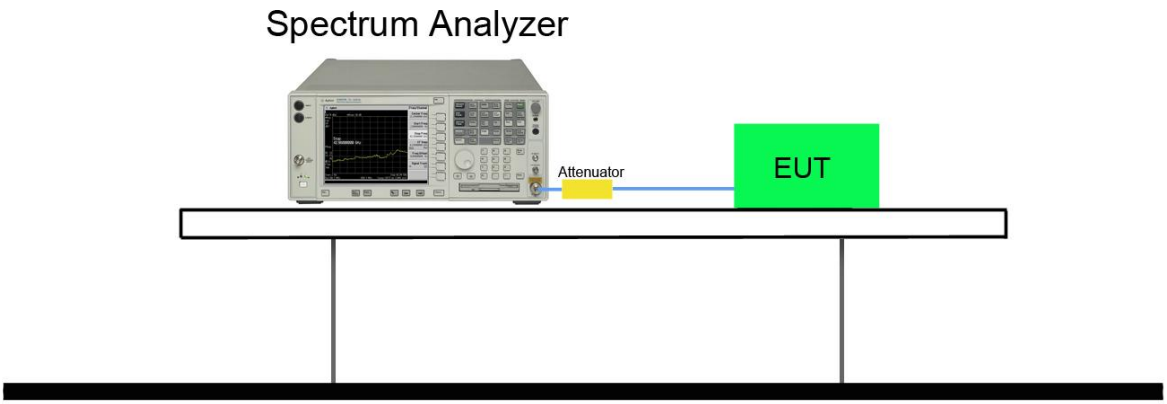
7.3.2. Test Procedure used

KDB 789033 D02v01r04 - Section C.2

7.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

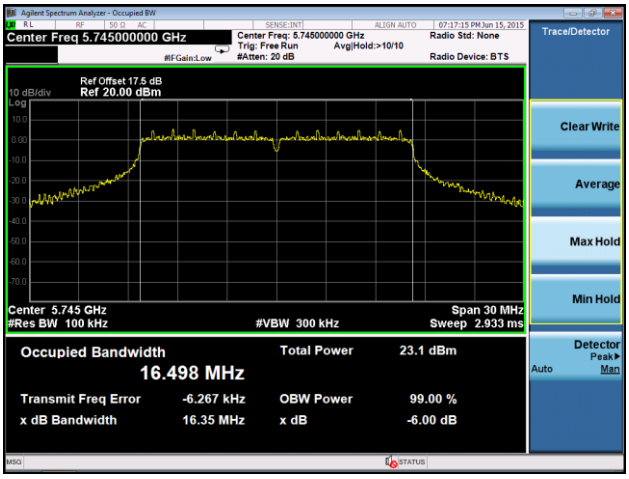
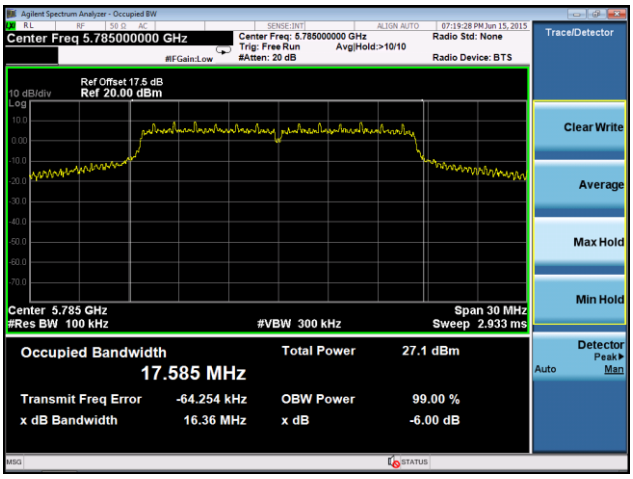
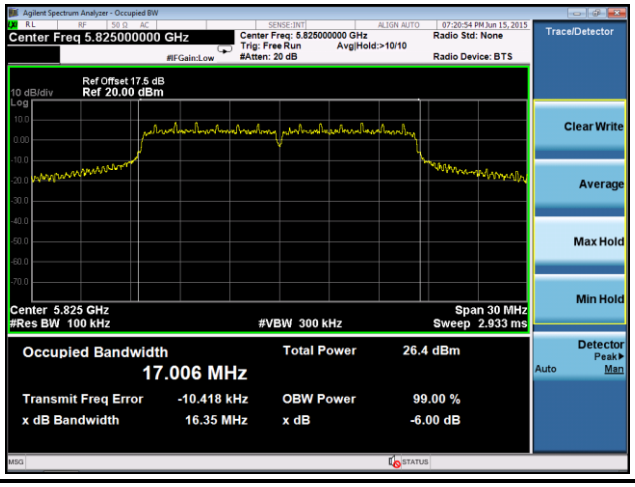
7.3.4. Test Setup

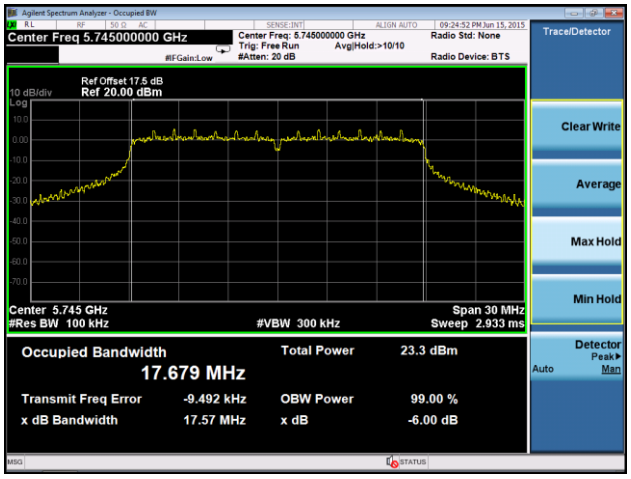
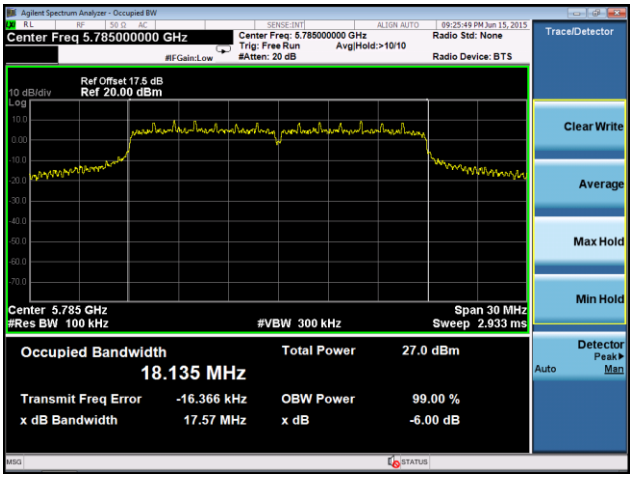
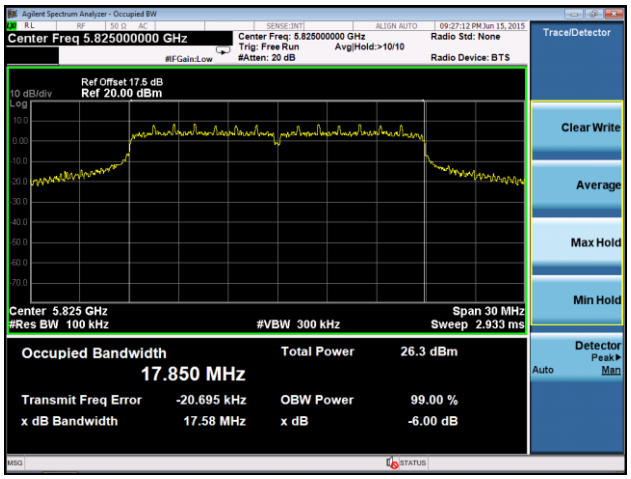


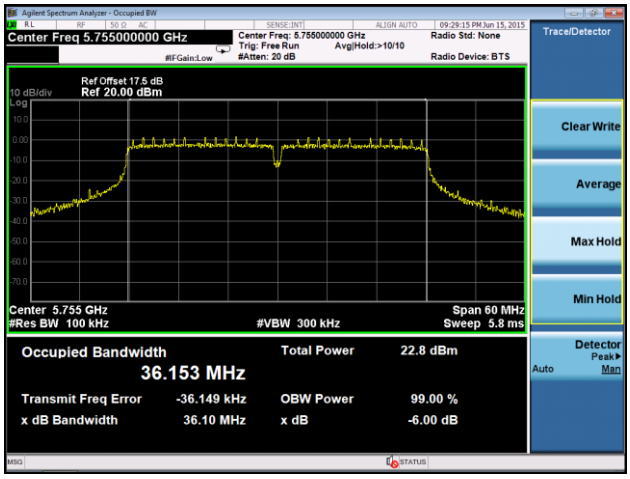
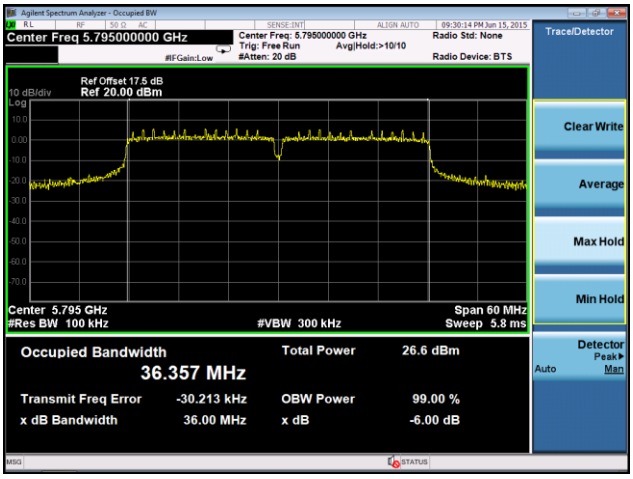
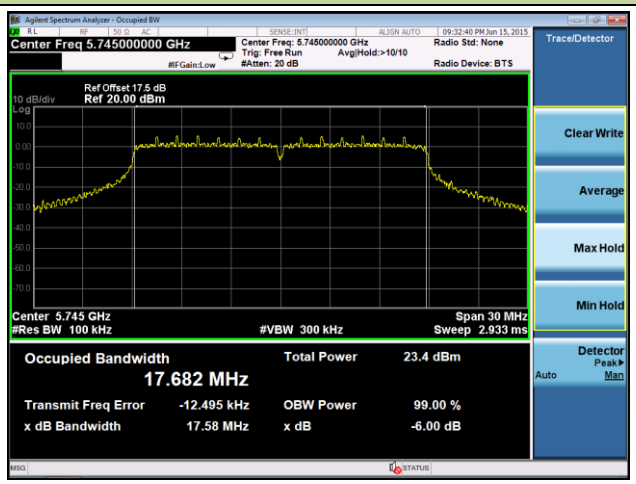
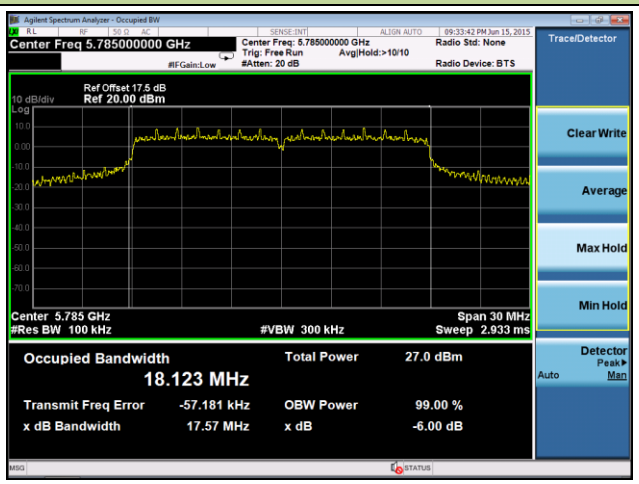
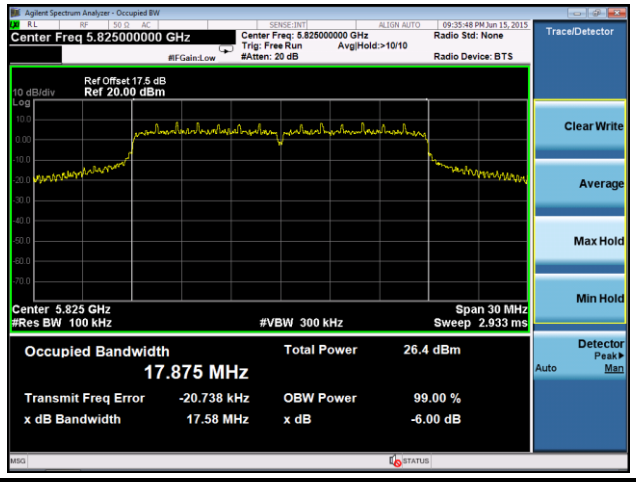
7.3.5. Test Result

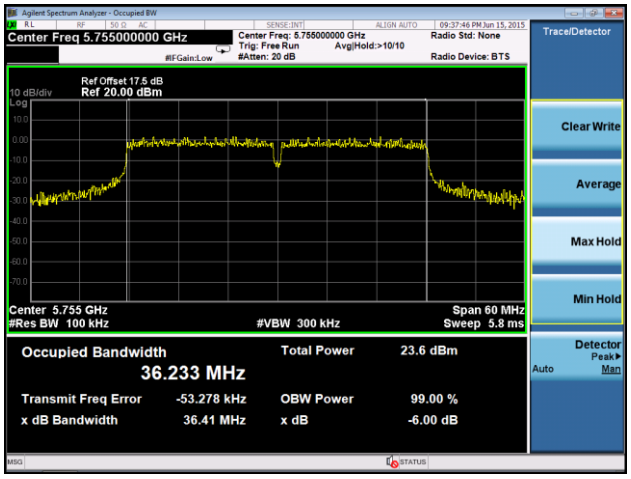
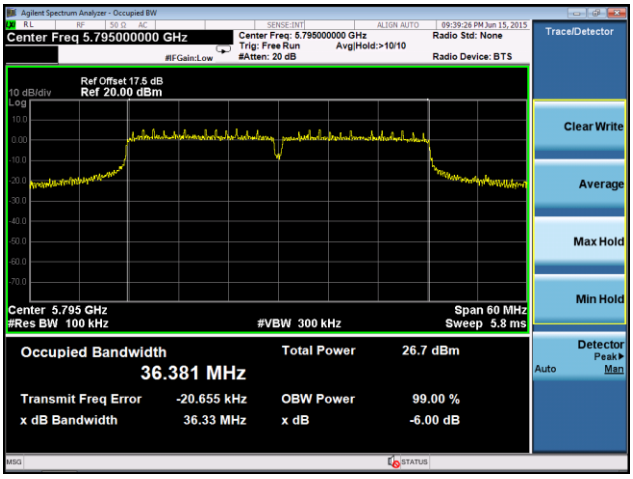
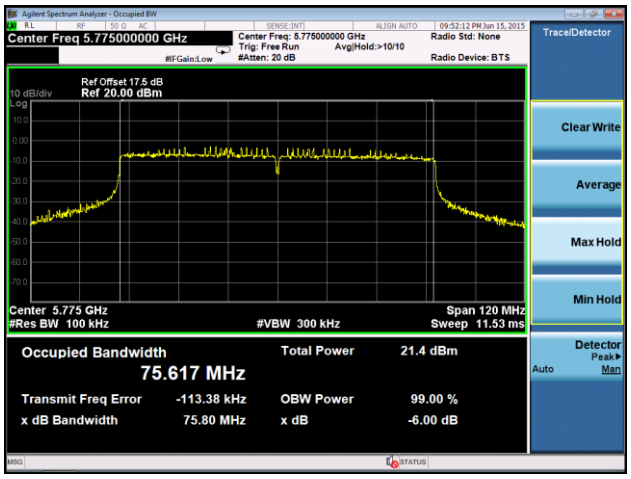
Product	WIRELESS ACCESS POINT	Temperature	25°C
Test Engineer	Polly Zong	Relative Humidity	54%
Test Site	TR3	Test Date	2015/06/15

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a	6	149	5745	16.35	≥0.5	Pass
802.11a	6	157	5785	16.36	≥0.5	Pass
802.11a	6	165	5825	16.35	≥0.5	Pass
802.11n-HT20	6.5	149	5745	17.57	≥0.5	Pass
802.11n-HT20	6.5	157	5785	17.57	≥0.5	Pass
802.11n-HT20	6.5	165	5825	17.58	≥0.5	Pass
802.11n-HT40	13.5	151	5755	36.10	≥0.5	Pass
802.11n-HT40	13.5	159	5795	36.00	≥0.5	Pass
802.11ac-VHT20	6.5	149	5745	17.58	≥0.5	Pass
802.11ac-VHT20	6.5	157	5785	17.57	≥0.5	Pass
802.11ac-VHT20	6.5	165	5825	17.58	≥0.5	Pass
802.11ac-VHT40	13.5	151	5755	36.41	≥0.5	Pass
802.11ac-VHT40	13.5	159	5795	36.33	≥0.5	Pass
802.11ac-VHT80	29.3	155	5775	75.80	≥0.5	Pass

802.11a 6dB Bandwidth	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	
Channel 165 (5825MHz)	
	

802.11n-HT20 6dB Bandwidth	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	
Channel 165 (5825MHz)	
	

802.11n-HT40 6dB Bandwidth	
Channel 151 (5755MHz)	Channel 159 (5795MHz)
	
802.11ac-VHT20 6dB Bandwidth	
Channel 149 (5745MHz)	Channel 157 (5785MHz)
	
Channel 165 (5825MHz)	
	

802.11ac-VHT40 6dB Bandwidth	
Channel 151 (5755MHz)	**Channel 159 (5795MHz)**
	
802.11ac-VHT80 6dB Bandwidth	
Channel 155 (5775MHz)	
	

7.4. Output Power Measurement

7.4.1. Test Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).

7.4.2. Test Procedure Used

KDB 789033 D02v01r04 - Section E) 3) b) Method PM-G

7.4.3. Test Setting

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. The trace was averaged over 100 traces to obtain the final measured average power.

7.4.4. Test Setup

7.4.5. Test Result

Power output test was verified over all data rates of each mode shown as below table.

For Ant 0 port:

Test Mode	Bandwidth	Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)
802.11a	20	36	5180	6	18.39
				24	18.02
				54	17.83
802.11n	20	36	5180	6.5	18.37
				7.2	18.13
				26.0	17.84
				28.9	17.67
				65.0	17.49
				72.2	17.22
802.11n	40	38	5190	13.5	15.94
				15.0	15.83
				54.0	15.54
				60.0	15.39
				135.0	15.13
				150.0	15.02
802.11ac	20	36	5180	6.5	18.39
				7.2	18.25
				39.0	18.13
				43.3	18.07
				78.0	17.76
				86.7	17.43
802.11ac	40	38	5190	13.5	15.82
				15.0	15.76
				108.0	15.51
				120.0	15.37
				180.0	15.19
				200.0	15.03

802.11ac	80	42	5210	29.3	19.42
				32.5	19.18
				234.0	18.83
				261.0	18.55
				390.0	18.36
				433.3	18.15

Product	WIRELESS ACCESS POINT	Temperature	25°C
Test Engineer	Bruce Wang	Relative Humidity	53%
Test Site	TR3	Test Date	2015/06/22

1Tx

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Limit (dBm)	Result
11a	1	6	36	5180	18.39	19.72	≤ 30.00	Pass
11a	1	6	44	5220	20.38	19.80	≤ 30.00	Pass
11a	1	6	48	5240	20.35	20.06	≤ 30.00	Pass
11a	1	6	149	5745	20.04	20.42	≤ 30.00	Pass
11a	1	6	157	5785	20.37	20.93	≤ 30.00	Pass
11a	1	6	165	5825	19.82	20.66	≤ 30.00	Pass
11n-HT20	1	6.5	36	5180	18.37	18.92	≤ 30.00	Pass
11n-HT20	1	6.5	44	5220	20.29	19.98	≤ 30.00	Pass
11n-HT20	1	6.5	48	5240	20.26	20.03	≤ 30.00	Pass
11n-HT20	1	6.5	149	5745	19.91	20.42	≤ 30.00	Pass
11n-HT20	1	6.5	157	5785	20.25	20.77	≤ 30.00	Pass
11n-HT20	1	6.5	165	5825	19.67	20.62	≤ 30.00	Pass
11n-HT40	1	13.5	38	5190	15.94	17.26	≤ 30.00	Pass
11n-HT40	1	13.5	46	5230	19.66	20.21	≤ 30.00	Pass
11n-HT40	1	13.5	151	5755	18.15	18.85	≤ 30.00	Pass
11n-HT40	1	13.5	159	5795	19.02	19.67	≤ 30.00	Pass
11ac-VHT20	1	6.5	36	5180	18.39	19.79	≤ 30.00	Pass
11ac-VHT20	1	6.5	44	5220	20.28	21.10	≤ 30.00	Pass
11ac-VHT20	1	6.5	48	5240	20.51	20.77	≤ 30.00	Pass
11ac-VHT20	1	6.5	149	5745	19.91	20.34	≤ 30.00	Pass
11ac-VHT20	1	6.5	157	5785	20.26	20.71	≤ 30.00	Pass
11ac-VHT20	1	6.5	165	5825	19.67	20.64	≤ 30.00	Pass
11ac-VHT40	1	13.5	38	5190	15.82	17.18	≤ 30.00	Pass
11ac-VHT40	1	13.5	46	5230	20.02	20.53	≤ 30.00	Pass
11ac-VHT40	1	13.5	151	5755	18.58	19.23	≤ 30.00	Pass
11ac-VHT40	1	13.5	159	5795	19.50	20.11	≤ 30.00	Pass
11ac-VHT80	1	29.3	42	5210	19.42	19.68	≤ 30.00	Pass
11ac-VHT80	1	29.3	155	5775	18.62	19.15	≤ 30.00	Pass

2Tx

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Limit (dBm)	Result
11n-HT20	2	13	36	5180	16.70	17.88	20.34	≤ 30.00	Pass
11n-HT20	2	13	44	5220	16.94	18.08	20.56	≤ 30.00	Pass
11n-HT20	2	13	48	5240	16.70	17.52	20.14	≤ 30.00	Pass
11n-HT20	2	13	149	5745	18.79	18.67	21.74	≤ 30.00	Pass
11n-HT20	2	13	157	5785	20.56	21.55	24.09	≤ 30.00	Pass
11n-HT20	2	13	165	5825	19.35	20.37	22.90	≤ 30.00	Pass
11n-HT40	2	27	38	5190	17.69	17.47	20.59	≤ 30.00	Pass
11n-HT40	2	27	46	5230	17.70	17.72	20.72	≤ 30.00	Pass
11n-HT40	2	27	151	5755	18.84	17.17	21.10	≤ 30.00	Pass
11n-HT40	2	27	159	5795	19.27	20.49	22.93	≤ 30.00	Pass
11ac-VHT20	2	13	36	5180	18.06	17.49	20.79	≤ 30.00	Pass
11ac-VHT20	2	13	44	5220	16.98	17.59	20.31	≤ 30.00	Pass
11ac-VHT20	2	13	48	5240	18.26	17.60	20.95	≤ 30.00	Pass
11ac-VHT20	2	13	149	5745	19.75	20.68	23.25	≤ 30.00	Pass
11ac-VHT20	2	13	157	5785	21.03	22.13	24.63	≤ 30.00	Pass
11ac-VHT20	2	13	165	5825	19.39	20.39	22.93	≤ 30.00	Pass
11ac-VHT40	2	27	38	5190	15.76	15.47	18.63	≤ 30.00	Pass
11ac-VHT40	2	27	46	5230	18.84	18.84	21.85	≤ 30.00	Pass
11ac-VHT40	2	27	151	5755	17.28	18.19	20.77	≤ 30.00	Pass
11ac-VHT40	2	27	159	5795	19.20	20.43	22.87	≤ 30.00	Pass
11ac-VHT80	2	58.6	42	5210	14.34	14.67	17.52	≤ 30.00	Pass
11ac-VHT80	2	58.6	155	5775	12.76	13.89	16.37	≤ 30.00	Pass

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

7.5. Power Spectral Density Measurement

7.5.1. Test Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum powerspectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi areused, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

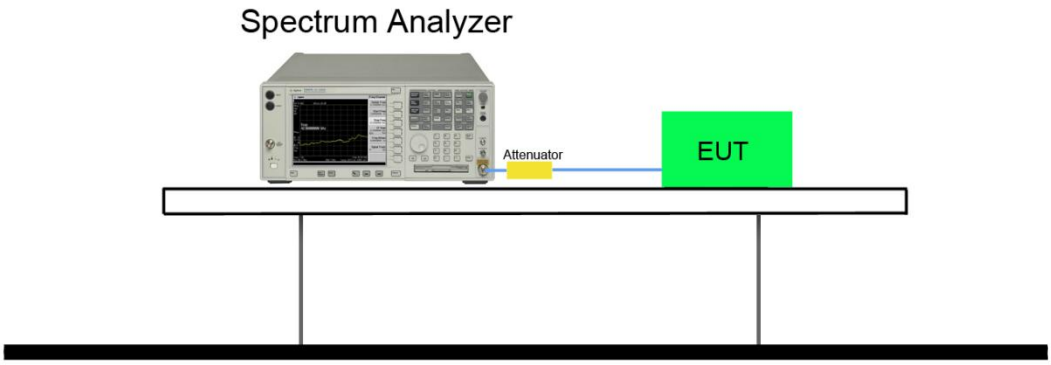
7.5.2. Test Procedure Used

KDB 789033 D02v01r04 - Section F

7.5.3. Test Setting

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz, RBW = 100 kHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 × (span / RBW)
6. Detector = power averaging (Average)
7. Sweep time = auto
8. Trigger = free run
9. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
10. Add 10*log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10*log(1/0.25) = 6 dB if the duty cycle is 25 percent.
11. When the measurement bandwidth of Maximum PSD is specified in 500 kHz, add a constant factor 10*log(500kHz/100kHz) = 7 dB to the measured result

7.5.4. Test Setup



7.5.5. Test Result

Product	WIRELESS ACCESS POINT	Temperature	23°C
Test Engineer	Bruce Wang	Relative Humidity	54%
Test Site	TR3	Test Date	2017/07/03

1Tx (U-NII-1 Band)

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/ MHz)	Ant 1 PSD (dBm/ MHz)	Duty Cycle (%)	Max PSD (dBm/ MHz)	Limit (dBm /MHz)	Result
11a	1	6	36	5180	7.10	7.95	96.9	8.09	≤ 17.00	Pass
11a	1	6	44	5220	9.22	8.25	96.9	9.36	≤ 17.00	Pass
11a	1	6	48	5240	9.23	9.02	96.9	9.37	≤ 17.00	Pass
11n-HT20	1	6.5	36	5180	8.11	7.36	94.4	8.36	≤ 17.00	Pass
11n-HT20	1	6.5	44	5220	9.08	8.46	94.4	9.33	≤ 17.00	Pass
11n-HT20	1	6.5	48	5240	8.96	8.71	94.4	9.21	≤ 17.00	Pass
11n-HT40	1	13.5	38	5190	1.65	-0.31	85.8	2.32	≤ 17.00	Pass
11n-HT40	1	13.5	46	5230	5.20	5.73	85.8	6.40	≤ 17.00	Pass
11ac-VHT20	1	6.5	36	5180	6.24	7.69	95.0	7.91	≤ 17.00	Pass
11ac-VHT20	1	6.5	44	5220	8.79	9.45	95.0	9.67	≤ 17.00	Pass
11ac-VHT20	1	6.5	48	5240	8.92	9.14	95.0	9.36	≤ 17.00	Pass
11ac-VHT40	1	13.5	38	5190	1.46	2.80	93.5	3.09	≤ 17.00	Pass
11ac-VHT40	1	13.5	46	5230	5.17	6.05	93.5	6.34	≤ 17.00	Pass
11ac-VHT80	1	29.3	42	5210	1.88	1.82	80.0	2.85	≤ 17.00	Pass

Note: When EUT duty cycle < 98%, the Max PSD = $10*\log\{10^{(\text{Max PSD}/10)}\} + 10*\log(1/\text{duty cycle})$.

2Tx (U-NII-1 Band)

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/ MHz)	Ant 1 PSD (dBm/ MHz)	Duty Cycle (%)	Total PSD (dBm/ MHz)	Limit (dBm /MHz)	Result
11n-HT20	2	13	36	5180	6.48	6.92	94.4	9.96	≤ 17.00	Pass
11n-HT20	2	13	44	5220	6.28	6.07	94.4	9.44	≤ 17.00	Pass
11n-HT20	2	13	48	5240	6.29	6.09	94.4	9.45	≤ 17.00	Pass
11n-HT40	2	27	38	5190	5.02	4.81	85.8	8.59	≤ 17.00	Pass
11n-HT40	2	27	46	5230	5.11	5.34	85.8	8.90	≤ 17.00	Pass
11ac-VHT20	2	13	36	5180	6.90	6.48	95.0	9.93	≤ 17.00	Pass
11ac-VHT20	2	13	44	5220	6.74	6.25	95.0	9.73	≤ 17.00	Pass
11ac-VHT20	2	13	48	5240	5.38	6.25	95.0	9.07	≤ 17.00	Pass
11ac-VHT40	2	27	38	5190	5.08	4.71	93.5	8.20	≤ 17.00	Pass
11ac-VHT40	2	27	46	5230	5.29	5.06	93.5	8.48	≤ 17.00	Pass
11ac-VHT80	2	58.6	42	5210	1.89	2.00	80.0	5.92	≤ 17.00	Pass

Note: When EUT duty cycle < 98%, the total PSD = $10*\log\{10^{(\text{Ant 0 PSD}/10)}+10^{(\text{Ant 1 PSD}/10)}\} + 10*\log(1/\text{duty cycle})$.

1Tx (U-NII-3 Band)

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/ 100kHz)	Ant 1 PSD (dBm/ 100kHz)	Duty Cycle (%)	Constant Factor (dB)	Max PSD (dBm/ 500kHz)	Limit (dBm/ 500kHz)	Result
11a	1	6	149	5745	-0.01	0.05	96.9	7.00	7.19	≤ 30.00	Pass
11a	1	6	157	5785	0.31	-0.14	96.9	7.00	7.45	≤ 30.00	Pass
11a	1	6	165	5825	-0.39	-0.47	96.9	7.00	6.75	≤ 30.00	Pass
11n-HT20	1	6.5	149	5745	-0.61	-0.41	94.4	7.00	6.84	≤ 30.00	Pass
11n-HT20	1	6.5	157	5785	-0.29	-0.48	94.4	7.00	6.96	≤ 30.00	Pass
11n-HT20	1	6.5	165	5825	-1.05	-0.17	94.4	7.00	7.08	≤ 30.00	Pass
11n-HT40	1	13.5	151	5755	-4.66	-4.59	85.8	7.00	3.08	≤ 30.00	Pass
11n-HT40	1	13.5	159	5795	-3.97	-3.90	85.8	7.00	3.77	≤ 30.00	Pass
11ac-VHT20	1	6.5	149	5745	-0.44	-0.38	95.0	7.00	6.84	≤ 30.00	Pass
11ac-VHT20	1	6.5	157	5785	-0.26	-0.19	95.0	7.00	7.03	≤ 30.00	Pass
11ac-VHT20	1	6.5	165	5825	-1.09	-0.90	95.0	7.00	6.32	≤ 30.00	Pass
11ac-VHT40	1	13.5	151	5755	-4.78	-4.56	93.5	7.00	2.73	≤ 30.00	Pass
11ac-VHT40	1	13.5	159	5795	-3.39	-3.49	93.5	7.00	3.90	≤ 30.00	Pass
11ac-VHT80	1	29.3	155	5775	-7.17	-7.39	80.0	7.00	0.80	≤ 30.00	Pass

Note: When EUT duty cycle < 98%, the Max PSD = Max PSD + 10*log(1/duty cycle) + Constant Factor (dB).

2Tx (U-NII-3 Band)

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/ 100kHz)	Ant 1 PSD (dBm/ 100kHz)	Duty Cycle (%)	Constant Factor (dB)	Total PSD (dBm/ 500kHz)	Limit (dBm/ 500kHz)	Result
11n-HT20	2	13	149	5745	-0.52	-0.21	94.4	7.00	9.90	≤ 30.00	Pass
11n-HT20	2	13	157	5785	-0.43	-0.59	94.4	7.00	9.75	≤ 30.00	Pass
11n-HT20	2	13	165	5825	-0.70	-0.78	94.4	7.00	9.52	≤ 30.00	Pass
11n-HT40	2	27	151	5755	-4.45	-4.74	85.8	7.00	6.08	≤ 30.00	Pass
11n-HT40	2	27	159	5795	-3.65	-3.55	85.8	7.00	7.08	≤ 30.00	Pass
11ac-VHT20	2	13	149	5745	-0.35	0.06	95.0	7.00	10.09	≤ 30.00	Pass
11ac-VHT20	2	13	157	5785	-0.53	-0.30	95.0	7.00	9.82	≤ 30.00	Pass
11ac-VHT20	2	13	165	5825	-0.70	-0.72	95.0	7.00	9.52	≤ 30.00	Pass
11ac-VHT40	2	27	151	5755	-4.45	-4.07	93.5	7.00	6.05	≤ 30.00	Pass
11ac-VHT40	2	27	159	5795	-4.81	-4.17	93.5	7.00	5.82	≤ 30.00	Pass
11ac-VHT80	2	58.6	155	5775	-7.42	-7.05	80.0	7.00	3.75	≤ 30.00	Pass

Note: When EUT duty cycle < 98%, the Max PSD = $10*\log\{10^{(\text{Ant0 PSD}/10)} + 10^{(\text{Ant1 PSD}/10)}\}$ + 10*log(1/duty cycle) + Constant Factor (dB).