

MEASUREMENT REPORT

FCC 15.407 WLAN 802.11a/n/ac

FCC ID: 2ABLK-804MESH

APPLICANT: Calix Inc.

Application Type: Certification

Product: 804Mesh Dual Wi-Fi

Model No.: 804MESH

Brand Name: Calix

FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s): Part 15 Subpart E (Section 15.407)

Test Procedure(s): ANSI C63.10-2013, KDB 789033 D02v02r01,
KDB 662911 D01v02r01

Test Date: August 05 ~ December 18, 2017

Reviewed By : Sunny Sun
(Sunny Sun)

Approved By : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v02r01. 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
1709RSU00408	Rev. 01	Initial Report	12-25-2017	Valid

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§2.1033 General Information

Applicant:	Calix Inc.
Applicant Address:	1035 N. McDowell Blvd Petaluma, CA94954 U.S.A
Manufacturer:	Wuxi MitraStar Technology Co.Ltd
Manufacturer Address:	1-1# Minshan Road, Wuxi New Wu District, Jiangsu, P.R.C.
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
IC Registration No.:	11384A-1
Test Device Serial No.:	N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> 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 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:	804Mesh Dual Wi-Fi
Model No.:	804MESH
Brand Name:	Calix
Wi-Fi Specification:	802.11a/b/g/n/ac
Frequency Range	<u>2.4GHz:</u> For 802.11b/g/n-HT20: 2412 ~ 2462 MHz For 802.11n-HT40: 2422 ~ 2452 MHz <u>5GHz:</u> For 802.11a/n-HT20/ac-VHT20: 5180~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Type of Modulation	802.11b: DSSS 802.11g/a/n/ac: OFDM
Modulation Technology	CCK, DQPSK, DBPSK for DSSS 16QAM, 64QAM, 256QAM, QPSK, BPSK for OFDM

2.2. Working Frequencies for this Report

802.11a/n-HT20/ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	144	5720 MHz	149	5745 MHz
153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--

802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
142	5710 MHz	151	5755 MHz	159	5795 MHz

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	138	5690 MHz	155	5775 MHz

2.3. 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

2.4. Description of Test Software

The test utility software used during testing was “Telnet.exe”.

2.5. Description of Available Antennas

Antenna Type	Frequency Band (MHz)	Tx Paths	Directional Gain (dBi)	
			Non Beam Forming Mode	CDD & Beam-Forming Mode
PCB Antenna	2.4	2	1.40	--
	5.2	4	--	8.90
	5.3	4	--	9.00
	5.5	4	--	8.70
	5.8	4	--	9.00

Note:

- Transmit at 2.4GHz support two antennas, and support four antennas at 5GHz transmit.
- The EUT working on Beam Forming mode at 802.11n/ac, and working on CDD mode at 802.11a.
- Correlated signals include, but are not limited to, signals transmitted in any of the following modes:
 - Any transmit Beam Forming mode, whether fixed or adaptive (e.g., phased array modes, closed loop MIMO modes, Transmitter Adaptive Antenna modes, Maximum Ratio Transmission (MRT) modes, and Statistical Eigen Beam Forming (EBF) modes).
- Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, \dots, G_N dBi
 - transmit signals are correlated, then
 - Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/N_{ANT}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

2.6. Description of Antenna RF Port

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

2.7. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS), 5GHz WLAN (UNII)

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 ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
802.11a	89.38 %
802.11n-HT20	98.41 %
802.11n-HT40	97.76 %
802.11ac-VHT20	99.00 %
802.11ac-VHT40	97.58 %
802.11ac-VHT80	94.91 %

2.8. Test Configuration

The device was tested per the guidance of KDB 789033 D02v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.9. EMI Suppression Device(s)/Modifications

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

2.10. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlets 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 D02v02r01 were used in the measurement.

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 **804Mesh Dual Wi-Fi** is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The **804Mesh Dual Wi-Fi FCC ID: 2ABLK-804MESH** 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	ESR7	MRTSUE06001	1 year	2018/08/18
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	Testo	608-H1	MRTSUE06404	1 year	2018/08/14
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06215	N/A	N/A

Radiated Disturbance - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/18
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2018/11/20
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2018/11/17
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2018/10/21
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2018/11/18
Digital Thermometer & Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2018/12/12
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2018/05/09

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2018/04/25
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2018/03/27
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2018/12/06
Temperature/Humidity Meter	Testo	608-H1	MRTSUE06401	1 year	2018/08/14

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
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{C(y)}$): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{C(y)}$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB

7. TEST RESULT

7.1. Summary

Product Name: 804Mesh Dual Wi-Fi

FCC ID: 2ABLK-804MESH

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)(iii), (2), (3)	Maximum Conducted Output Power	Refer to Section 7.5		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 7.5
15.407(a)(1)(iii), (2), (3), (5)	Peak Power Spectral Density	Refer to Section 7.7		Pass	Section 7.6
15.407(g)	Frequency Stability	N/A		Pass	Section 7.7
15.407(b)(1), (2), (3), (4)(i)	Undesirable Emissions	Refer to Section 7.9 & 7.10	Radiated	Pass	Section 7.8 & 7.9
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.10

Notes:

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

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

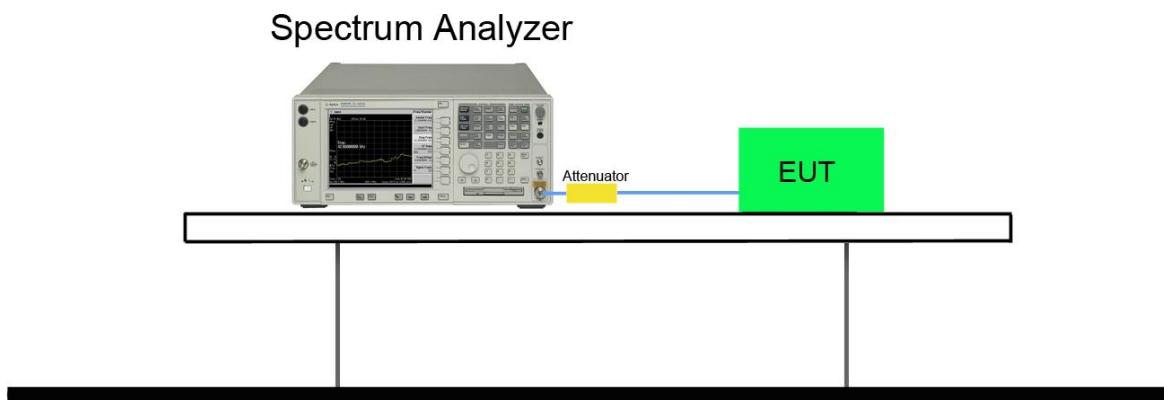
7.2.2. Test Procedure used

KDB 789033 D02v02r01 - Section C.1

7.2.3. Test Setting

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

7.2.4. Test Setup

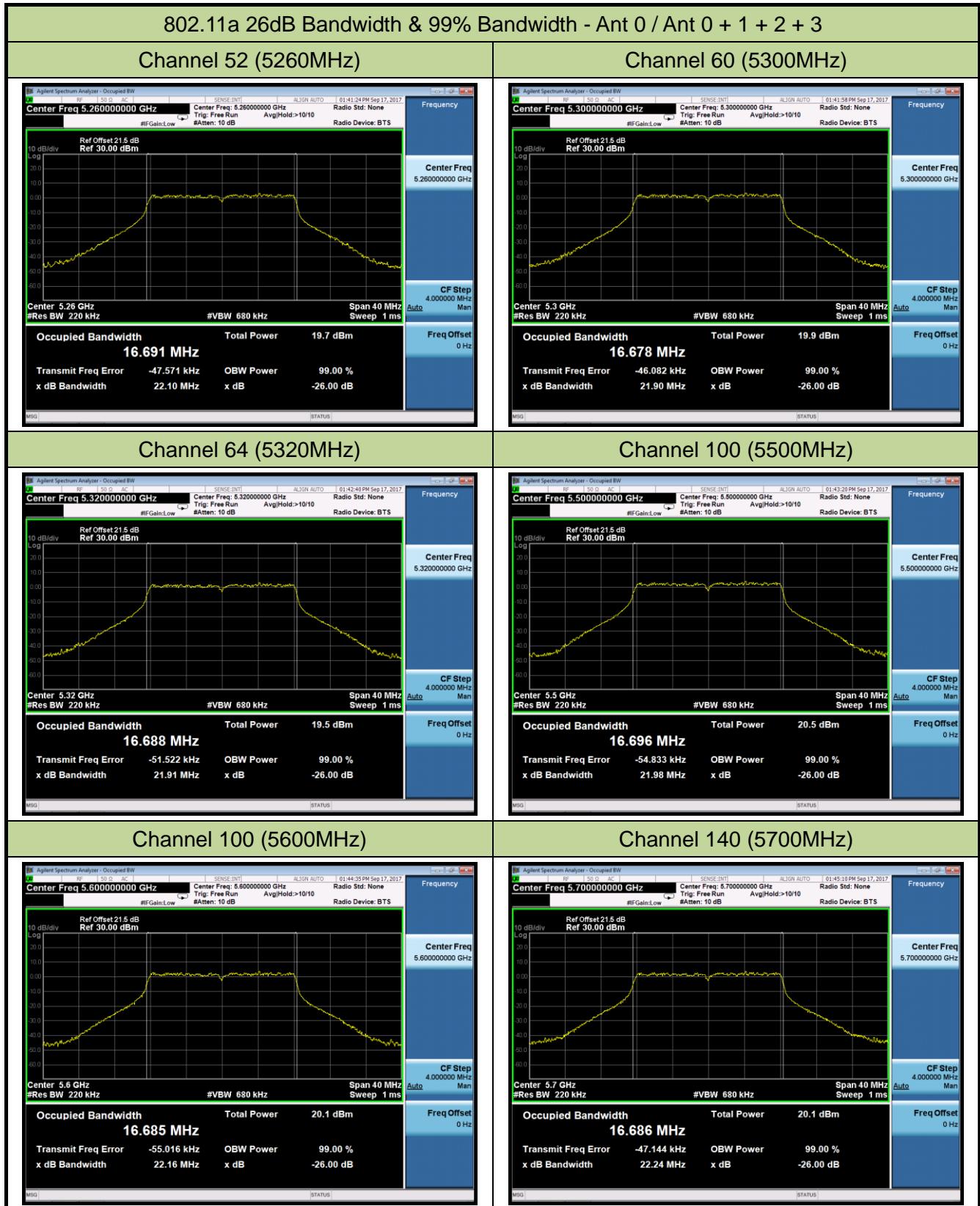


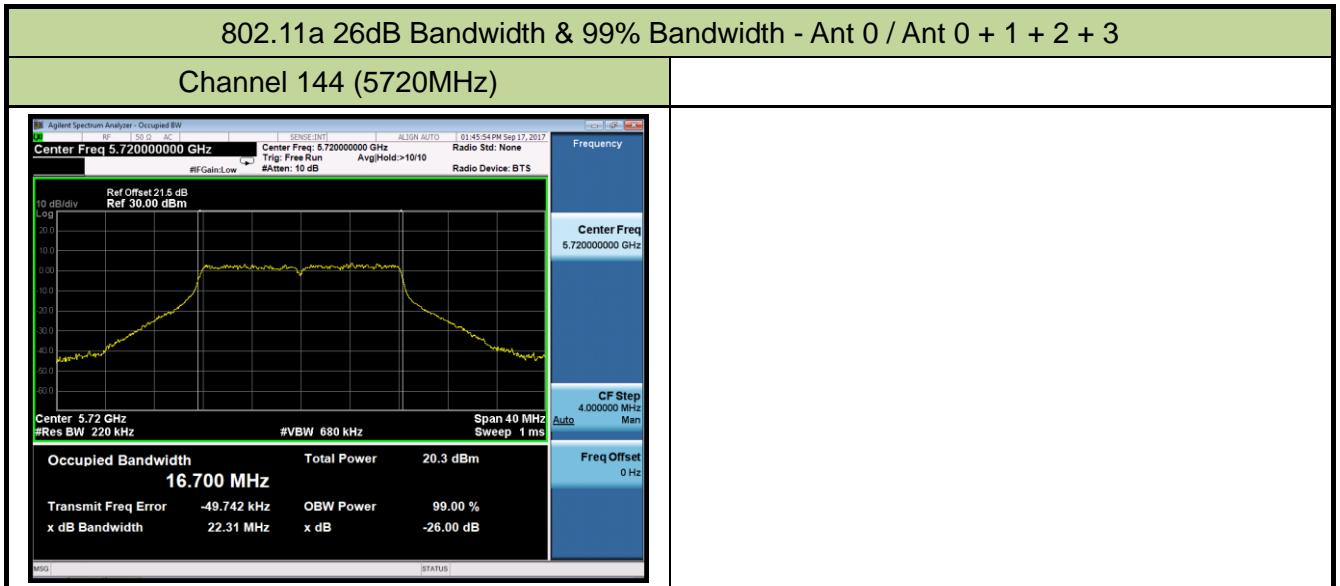
7.2.5. Test Result

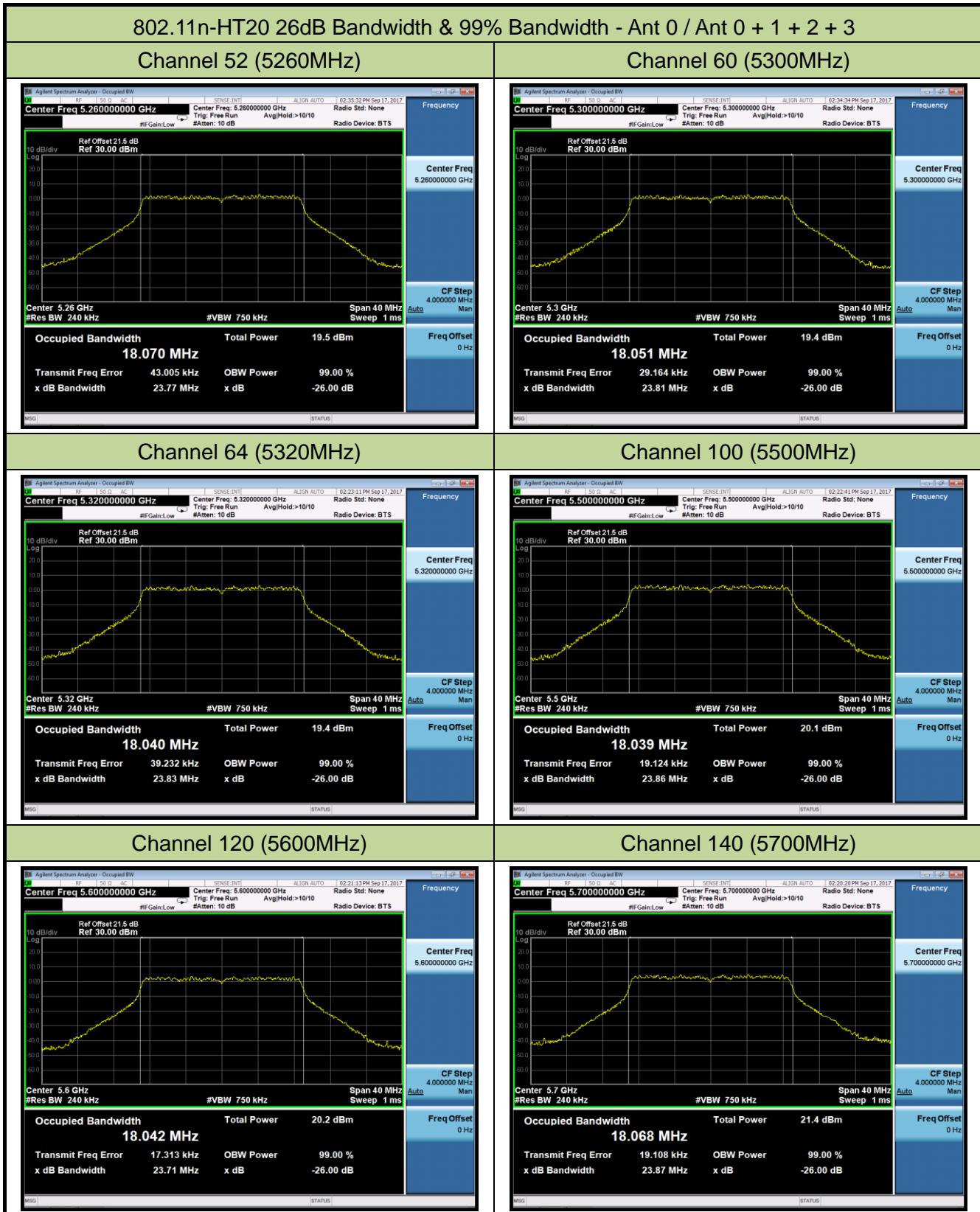
Product	804Mesh Dual Wi-Fi	Temperature	25°C
Test Engineer	Bruce Wang	Relative Humidity	50%
Test Site	TR3	Test Date	2017/09/17

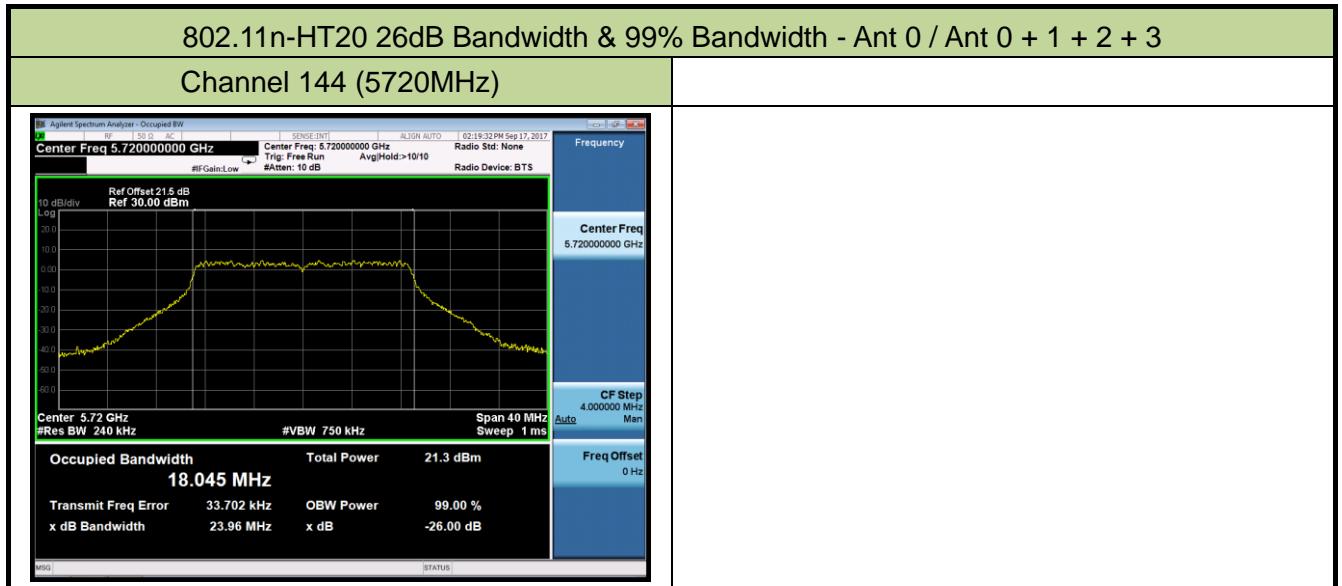
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Ant 0 / Ant 0 + 1 + 2 + 3					
802.11a	6Mbps	52	5260	22.10	16.69
802.11a	6Mbps	60	5300	21.90	16.68
802.11a	6Mbps	64	5320	21.91	16.69
802.11a	6Mbps	100	5500	21.98	16.70
802.11a	6Mbps	120	5600	22.16	16.69
802.11a	6Mbps	140	5700	22.24	16.69
802.11a	6Mbps	144	5720	22.31	16.70
802.11n-HT20	MCS0	52	5260	23.77	18.07
802.11n-HT20	MCS0	60	5300	23.81	18.05
802.11n-HT20	MCS0	64	5320	23.83	18.04
802.11n-HT20	MCS0	100	5500	23.86	18.04
802.11n-HT20	MCS0	120	5600	23.71	18.04
802.11n-HT20	MCS0	140	5700	23.87	18.07
802.11n-HT20	MCS0	144	5720	23.96	18.05
802.11n-HT40	MCS0	54	5270	42.53	36.48
802.11n-HT40	MCS0	62	5310	42.57	36.48
802.11n-HT40	MCS0	102	5510	42.57	36.46
802.11n-HT40	MCS0	118	5590	42.30	36.50
802.11n-HT40	MCS0	134	5670	42.82	36.50
802.11n-HT40	MCS0	142	5710	42.63	36.49
802.11ac-VHT20	MCS0	52	5260	24.10	18.09
802.11ac-VHT20	MCS0	60	5300	24.14	18.09
802.11ac-VHT20	MCS0	64	5320	23.97	18.10
802.11ac-VHT20	MCS0	100	5500	24.00	18.08
802.11ac-VHT20	MCS0	120	5600	24.15	18.09
802.11ac-VHT20	MCS0	140	5700	24.06	18.08
802.11ac-VHT20	MCS0	144	5720	24.29	18.12

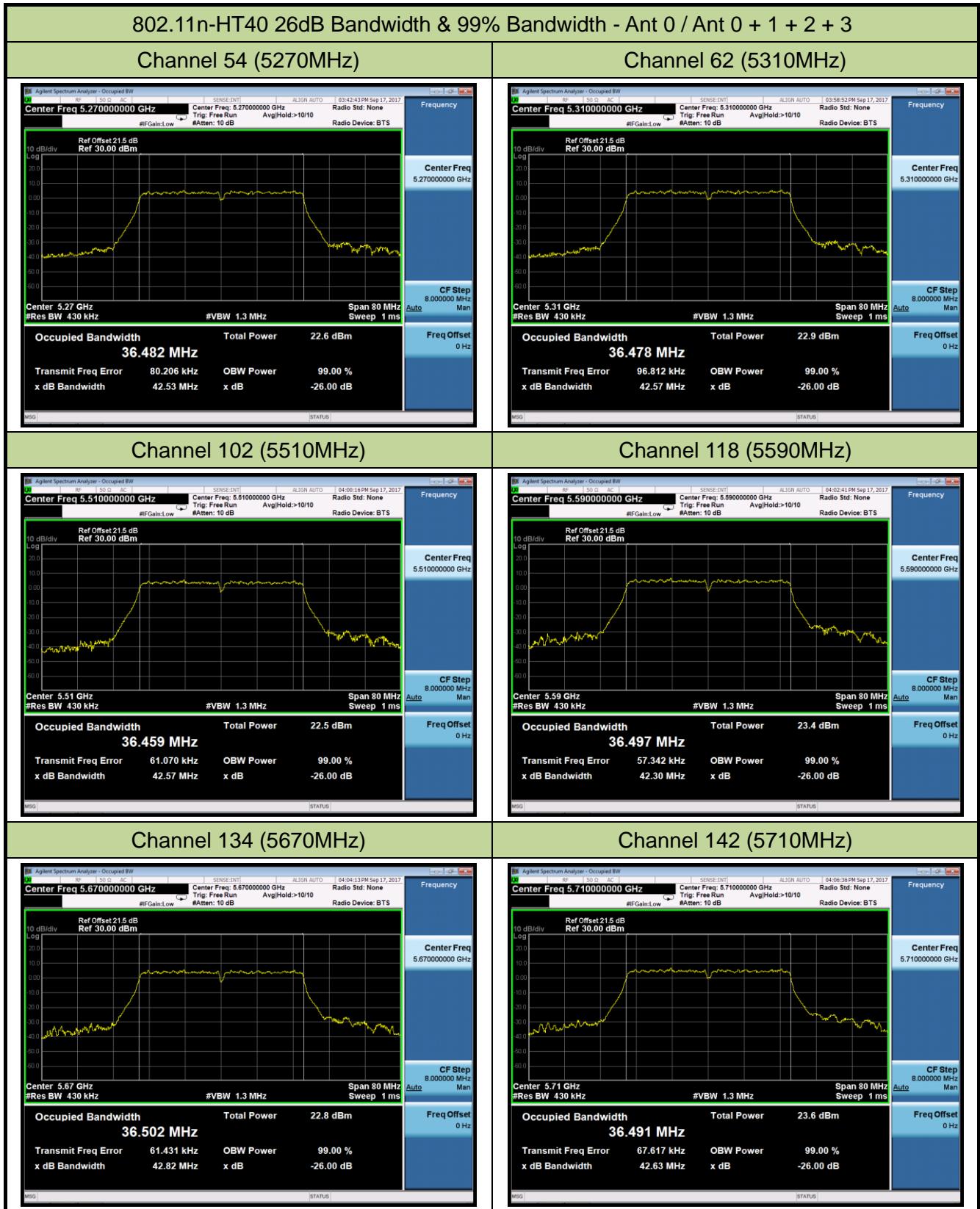
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac-VHT40	MCS0	54	5270	42.64	36.48
802.11ac-VHT40	MCS0	62	5310	42.63	36.48
802.11ac-VHT40	MCS0	102	5510	42.40	36.49
802.11ac-VHT40	MCS0	118	5590	42.40	36.51
802.11ac-VHT40	MCS0	134	5670	42.65	36.49
802.11ac-VHT40	MCS0	142	5710	42.67	36.50
802.11ac-VHT80	MCS0	58	5290	83.94	75.54
802.11ac-VHT80	MCS0	106	5530	84.13	75.58
802.11ac-VHT80	MCS0	122	5610	84.12	75.61
802.11ac-VHT80	MCS0	138	5690	84.42	75.65

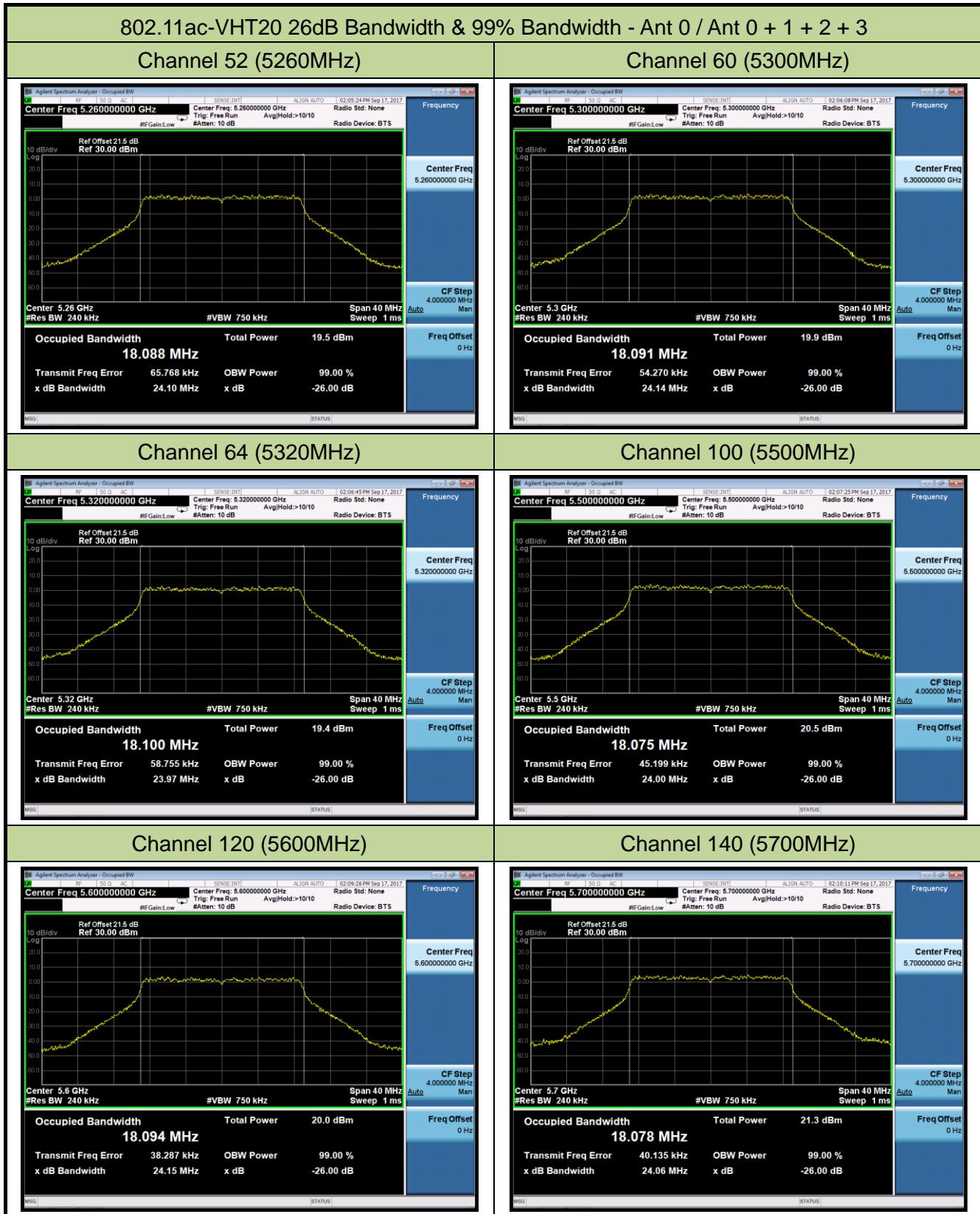


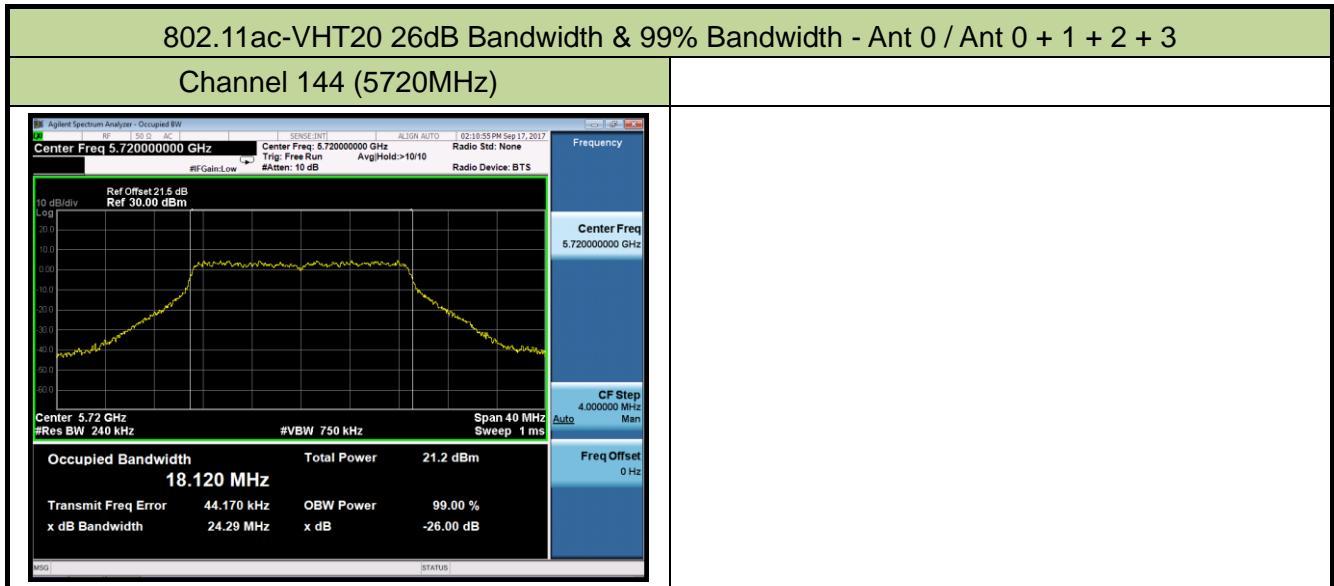


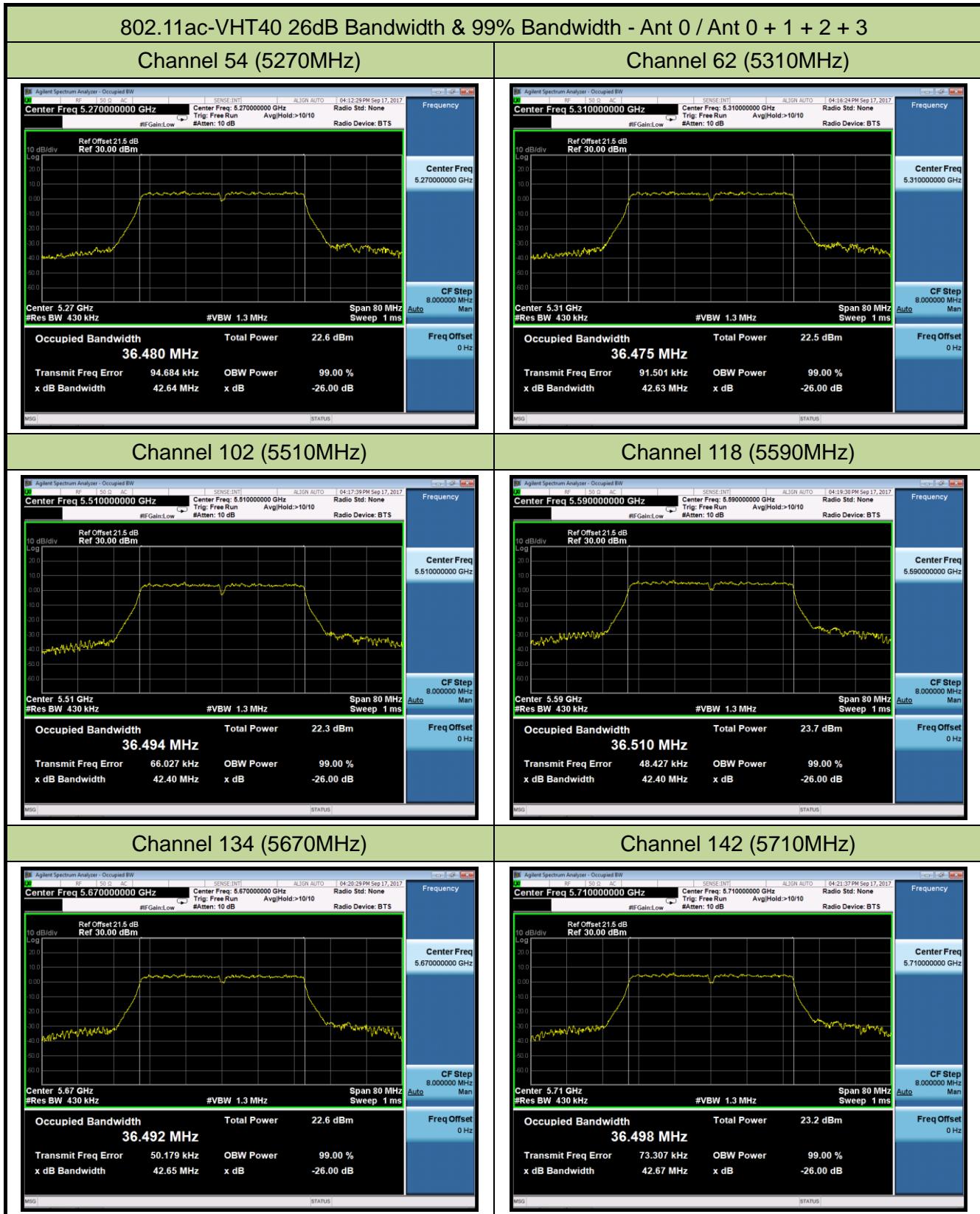


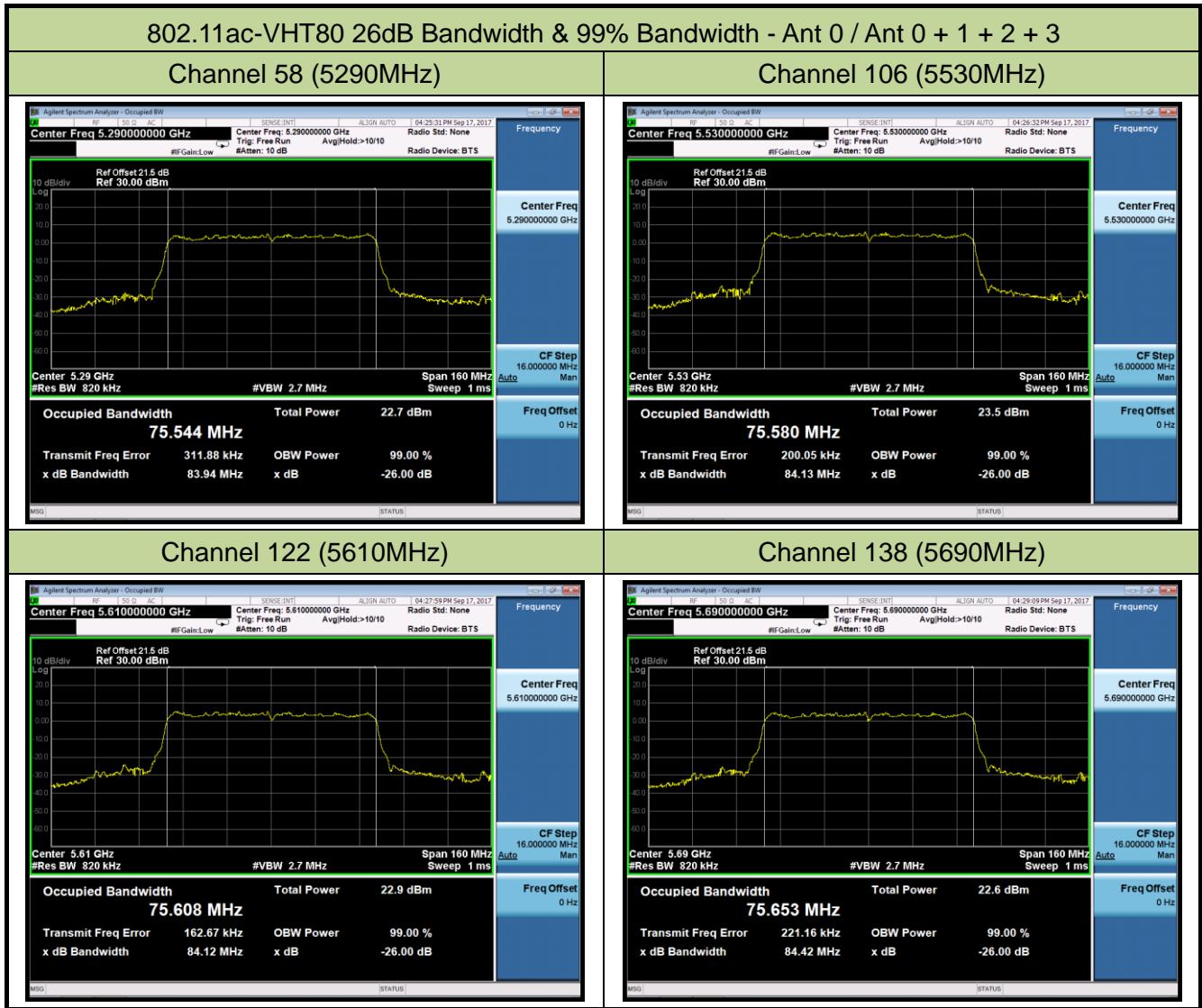












7.3. 6dB Bandwidth Measurement

7.3.1. Test Limit

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

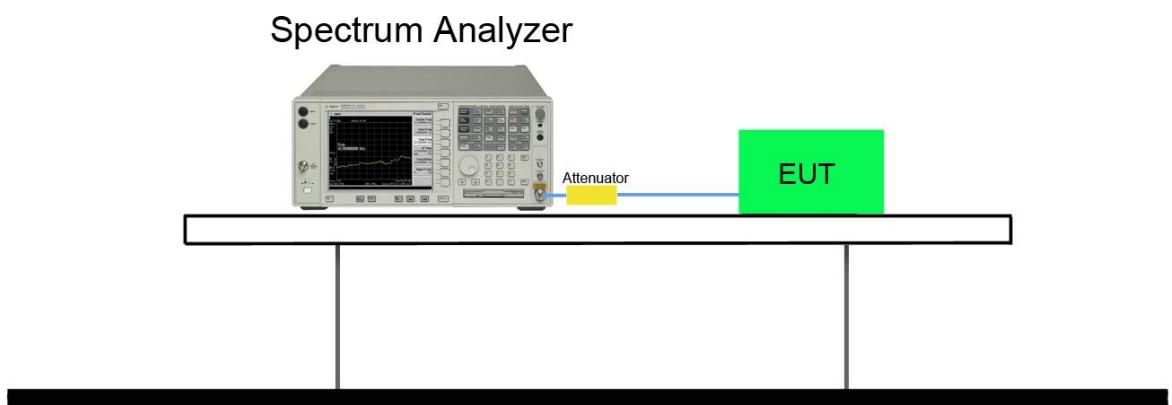
7.3.2. Test Procedure used

ANSI C63.10-2013 - Section 6.9.2

7.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW \geq 3 \times 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

Not Applicable.

7.4. Output Power Measurement

7.4.1. Test Limit

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz.

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

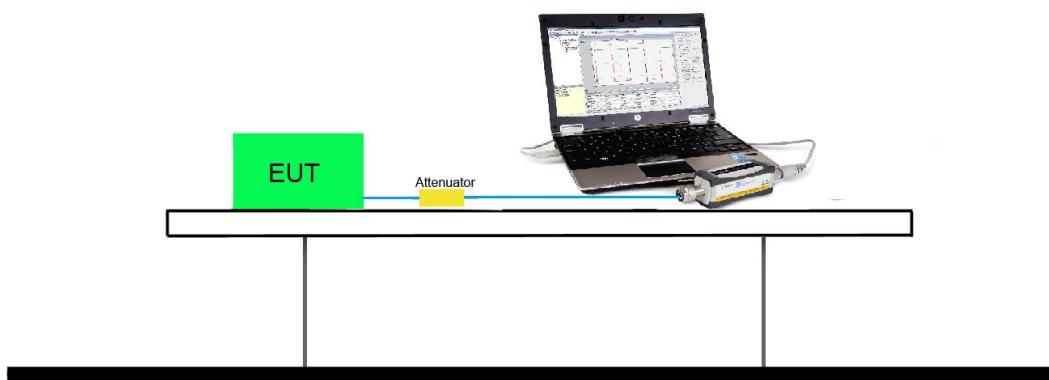
7.4.2. Test Procedure Used

KDB 789033 D02v02r01 - Section E) 3) b) Method PM-G

7.4.3. Test Setting

Average power measurements were performed 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.

7.4.4. Test Setup



7.4.5. Test Result

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

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

Test Mode	Bandwidth	Channel	Frequency (MHz)	Data Rate/ MCS	Average Power (dBm)
802.11a	20	36	5180	6Mbps	18.34
				24Mbps	18.04
				54Mbps	17.75
802.11n	20	36	5180	MCS0	17.66
				MCS3	17.32
				MCS7	17.06
802.11n	40	38	5190	MCS0	16.06
				MCS3	15.71
				MCS7	15.40
802.11ac	20	36	5180	MCS0	17.62
				MCS4	17.27
				MCS8	16.86
802.11ac	40	38	5190	MCS0	15.96
				MCS4	15.61
				MCS9	15.24
802.11ac	80	42	5210	MCS0	15.84
				MCS4	15.47
				MCS9	15.11

Product	804Mesh Dual Wi-Fi				Temperature		22°C		
Test Engineer	Bruce Wang				Relative Humidity		54%		
Test Site	TR3				Test Date		2017/09/19		
Test Item	Output Power Test								

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)	Average Power Limit (dBm)	Result
11a	6Mbps	52	5260	14.35	14.73	14.92	15.10	20.80	≤ 20.98	Pass
11a	6Mbps	60	5300	14.29	14.72	14.72	14.85	20.67	≤ 20.98	Pass
11a	6Mbps	64	5320	15.31	14.62	14.73	14.35	20.79	≤ 20.98	Pass
11a	6Mbps	100	5500	14.85	14.48	14.53	13.32	20.35	≤ 21.28	Pass
11a	6Mbps	116	5580	15.30	15.24	15.42	14.42	21.13	≤ 21.28	Pass
11a	6Mbps	120	5600	15.69	15.11	15.05	14.53	21.14	≤ 21.28	Pass
11a	6Mbps	140	5700	16.06	14.71	14.85	14.79	21.16	≤ 21.28	Pass
11a	6Mbps	144	5720	15.93	14.58	14.68	14.91	21.08	≤ 21.28	Pass
11n-HT20	MCS0	52	5260	15.30	14.82	14.62	14.66	20.88	≤ 20.98	Pass
11n-HT20	MCS0	60	5300	14.85	14.41	14.27	14.54	20.54	≤ 20.98	Pass
11n-HT20	MCS0	64	5320	14.86	14.75	14.36	14.40	20.62	≤ 20.98	Pass
11n-HT20	MCS0	100	5500	14.48	14.45	14.18	13.29	20.15	≤ 21.28	Pass
11n-HT20	MCS0	116	5580	14.38	14.48	13.94	13.20	20.05	≤ 21.28	Pass
11n-HT20	MCS0	120	5600	15.55	15.11	15.26	14.71	21.19	≤ 21.28	Pass
11n-HT20	MCS0	140	5700	16.03	14.79	14.67	14.84	21.14	≤ 21.28	Pass
11n-HT20	MCS0	144	5720	15.95	14.79	14.93	14.90	21.19	≤ 21.28	Pass

7.5. Transmit Power Control

7.5.1. Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

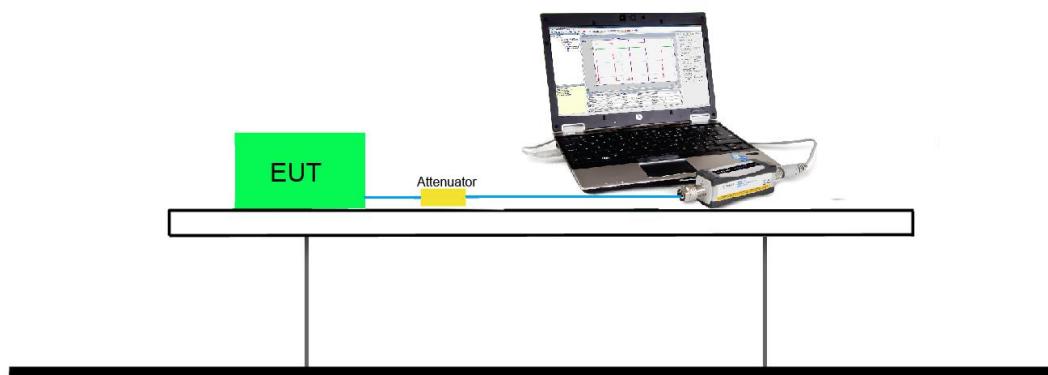
7.5.2. Test Procedure Used

KDB 789033 D02v01 - Section E) 3) b) Method PM-G

7.5.3. Test Setting

Average power measurements were performed 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.

7.5.4. Test Setup



7.6. Power Spectral Density Measurement

7.6.1. Test Limit

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

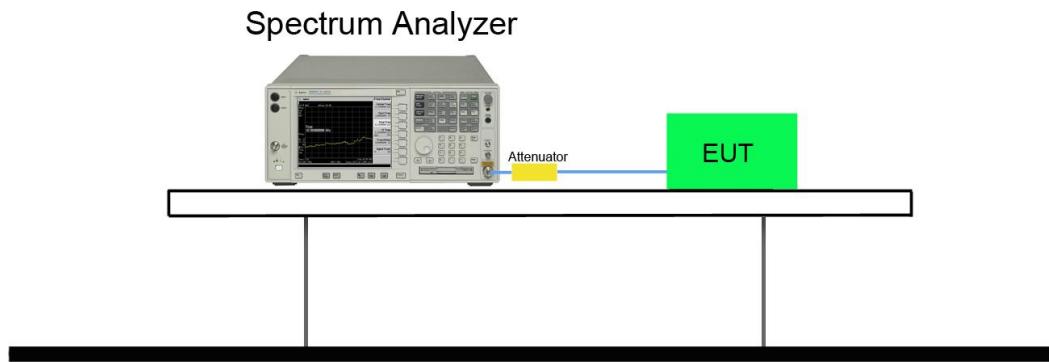
If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

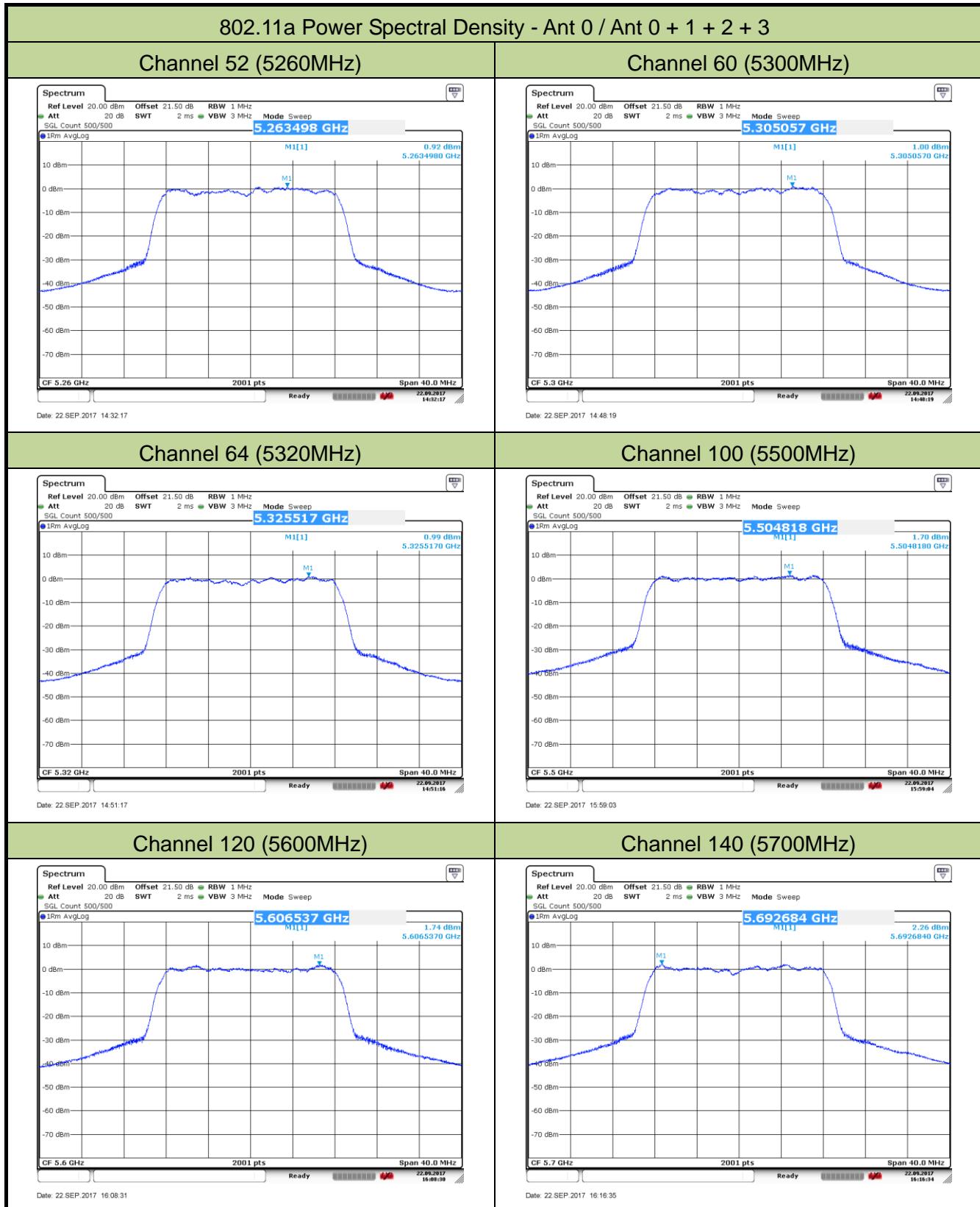
7.6.2. Test Procedure Used

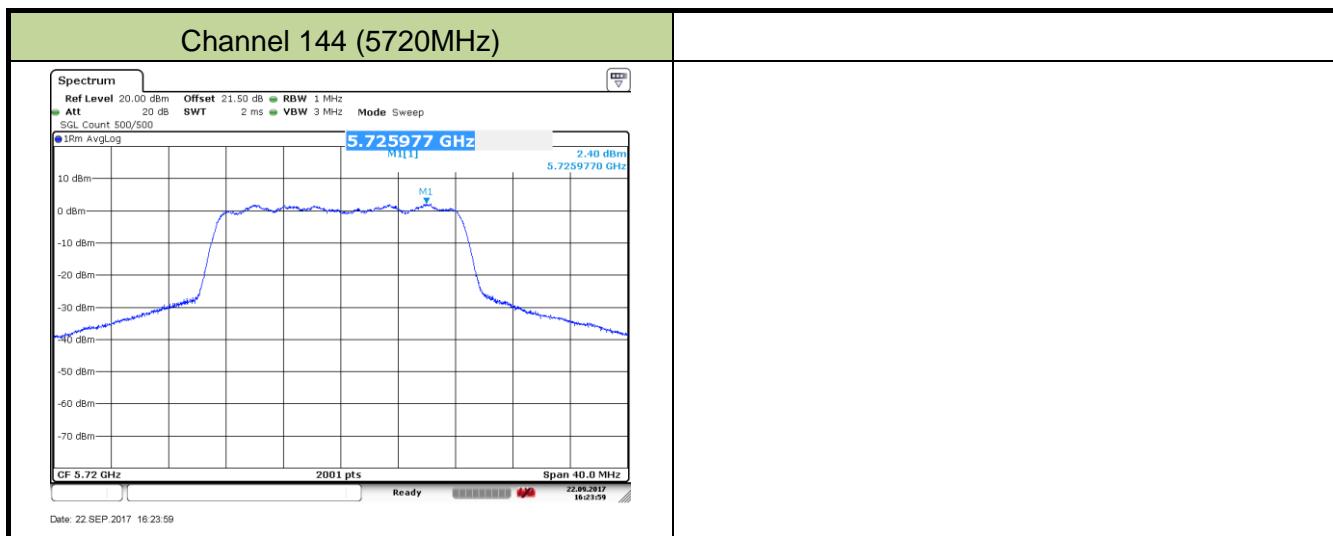
KDB 789033 D02v02r01 - Section F

7.6.3. Test Setting

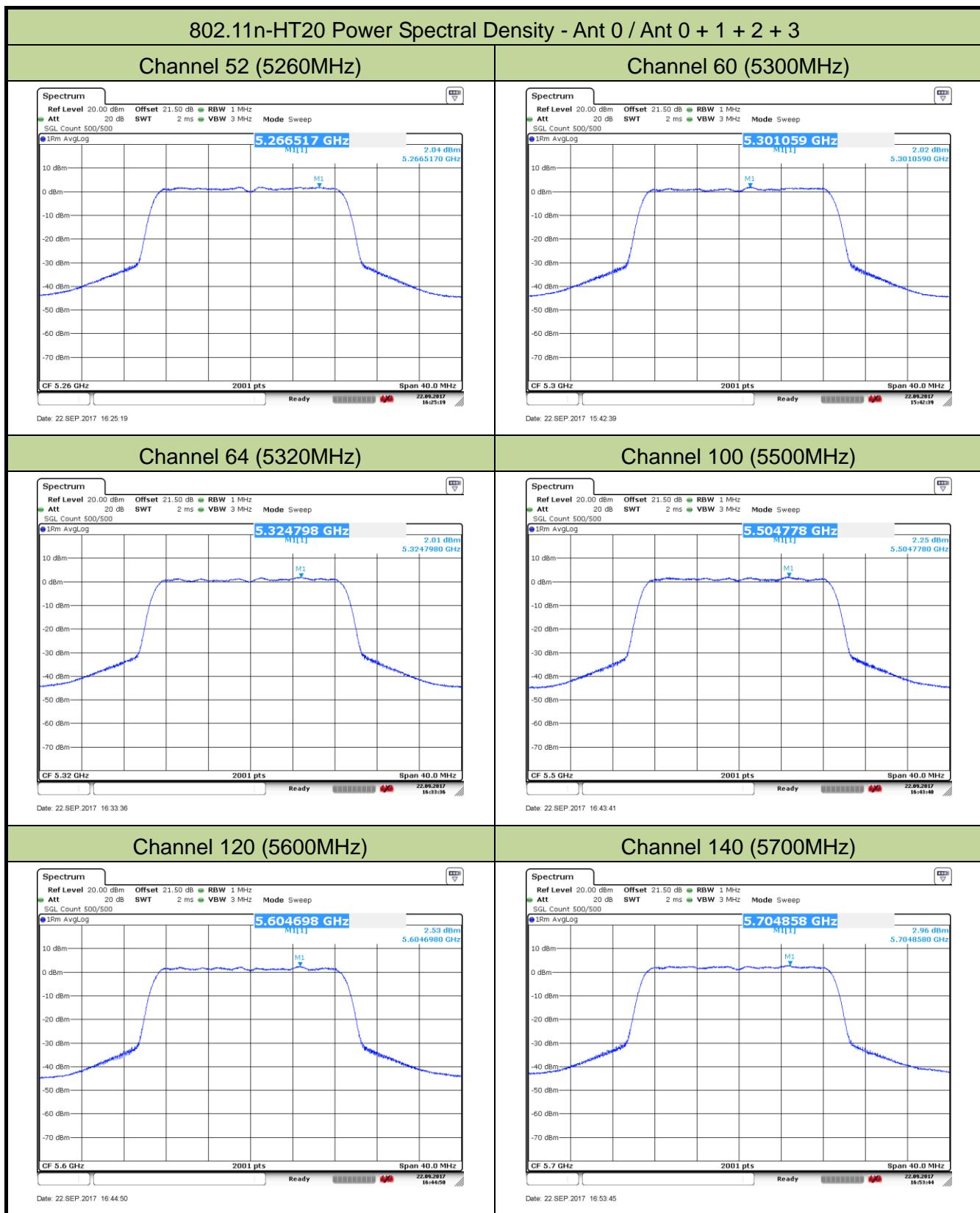
1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz,
RBW = 100 kHz
4. VBW = 3MHz
5. Number of sweep points $\geq 2 \times (\text{span} / \text{RBW})$
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 $10 \cdot \log(1/x)$, 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 $10 \cdot \log(1/0.25) = 6$ 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 $10 \cdot \log(500\text{kHz}/100\text{kHz}) = 6.99$ dB to the measured result.

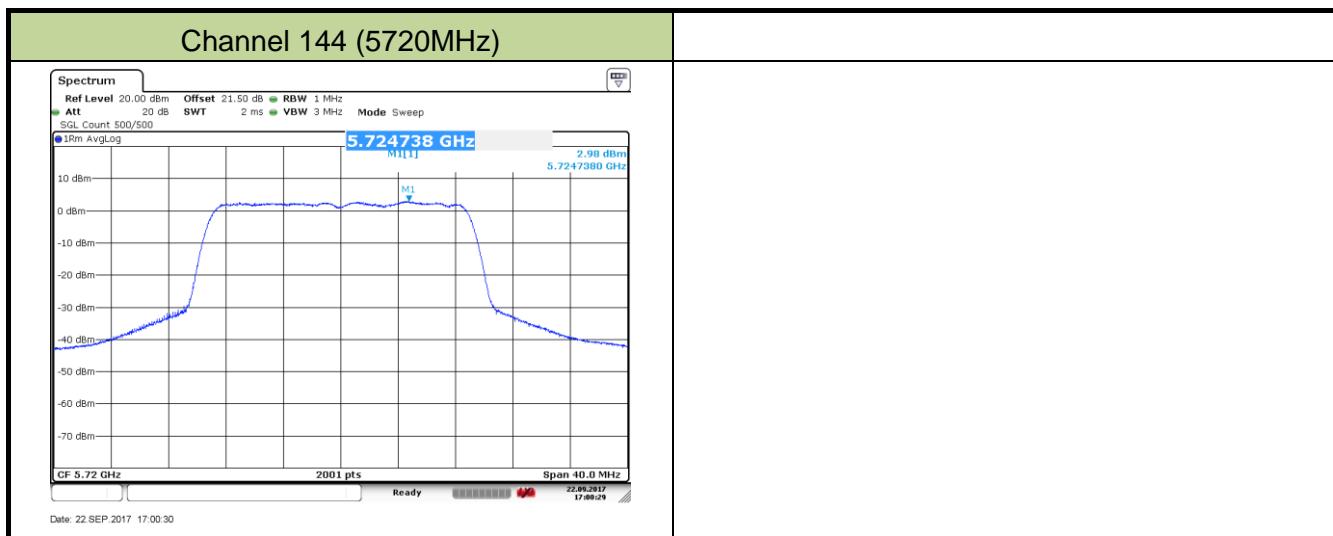
7.6.4. Test Setup





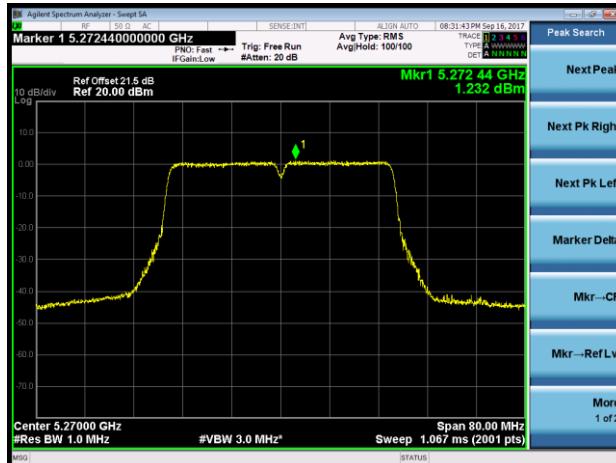
802.11n-HT20 Power Spectral Density - Ant 0 / Ant 0 + 1 + 2 + 3



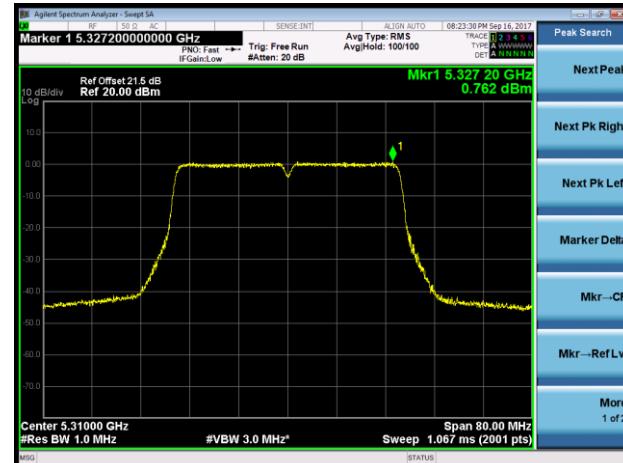


802.11n-HT40 Power Spectral Density - Ant 0 / Ant 0 + 1 + 2 + 3

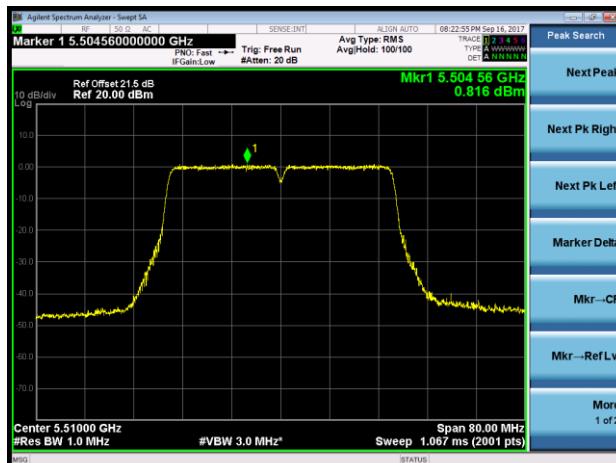
Channel 54 (5270MHz)



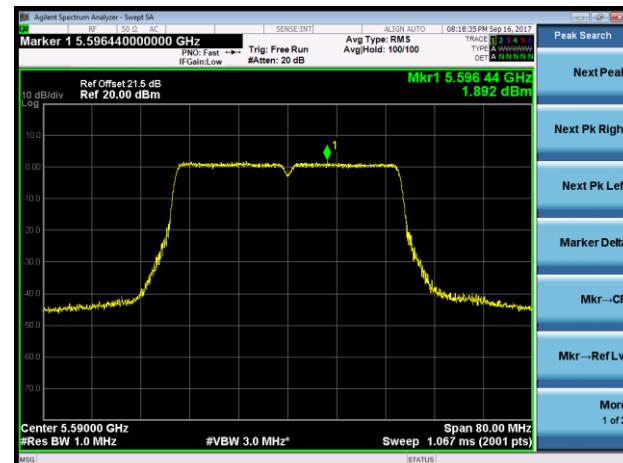
Channel 62 (5310MHz)



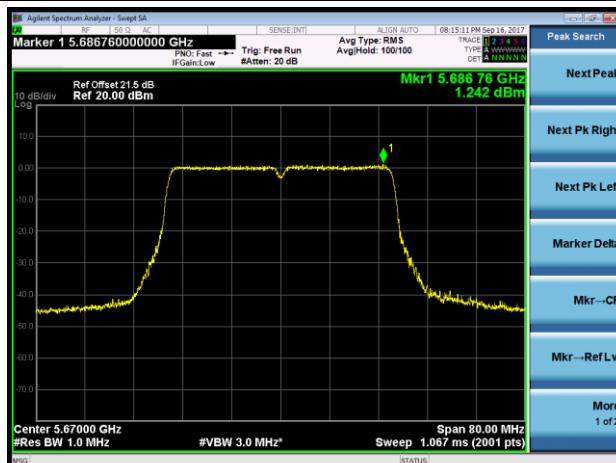
Channel 102 (5510MHz)



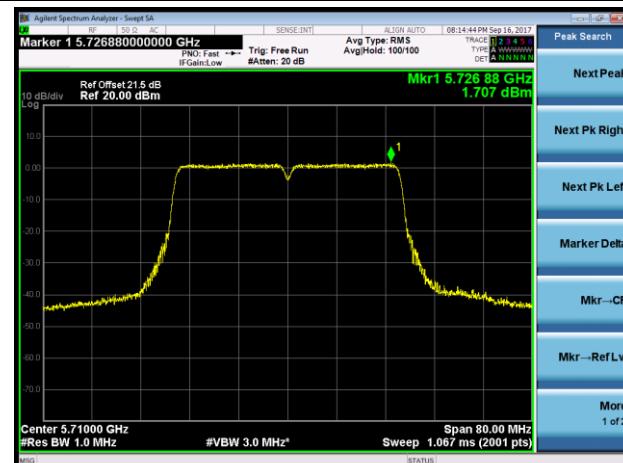
Channel 118 (5590MHz)



Channel 134 (5670MHz)

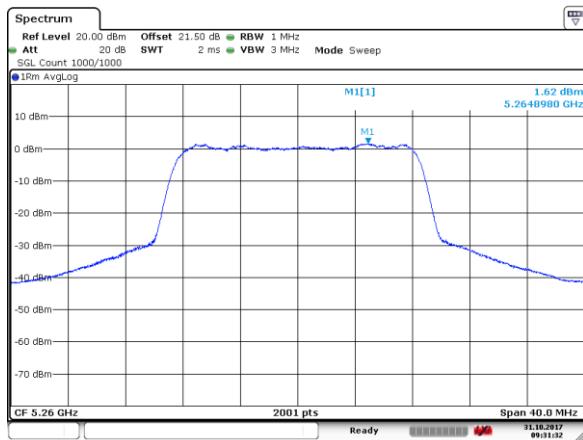


Channel 142 (5710MHz)

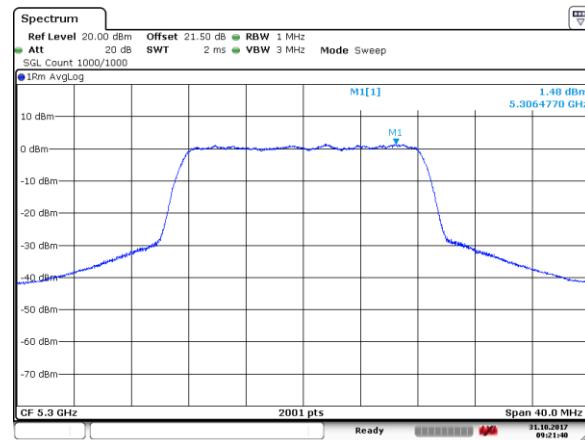


802.11ac-VHT20 Power Spectral Density - Ant 0 / Ant 0 + 1 + 2 + 3

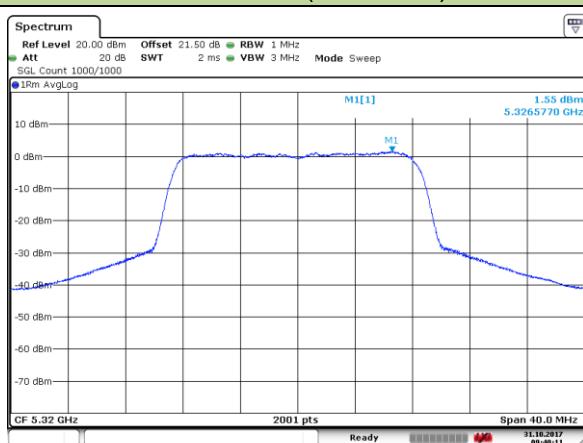
Channel 52 (5260MHz)



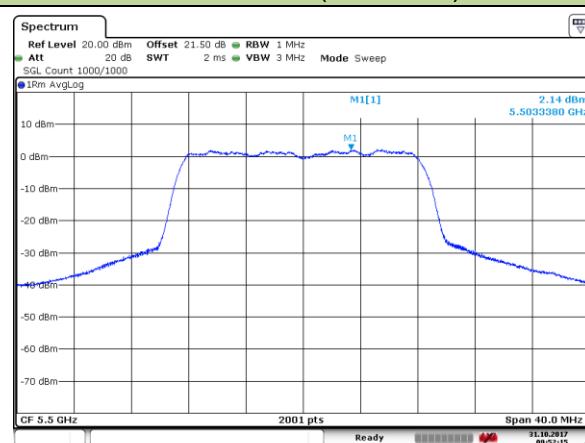
Channel 60 (5300MHz)



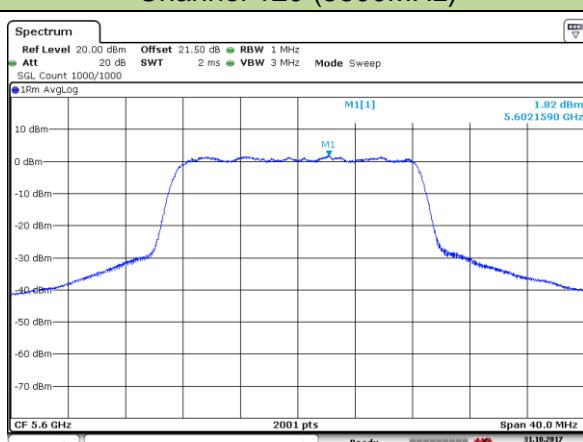
Channel 64 (5320MHz)



Channel 100 (5500MHz)



Channel 120 (5600MHz)



Channel 140 (5700MHz)

