MEASUREMENT REPORT

FCC PART 15.407/ RSS-247 WLAN 802.11a/n/ac

FCC ID:	VPYLBEE5HY1MW
IC:	772C-LBEE5HY1MW
APPLICANT:	Murata Manufacturing Co., Ltd.
Application Type:	Certification
Product:	Communication Module
Model No.:	LBEE5HY1MW
HVIN:	LBEE5HY1MW
FCC Classification:	Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
IC Rule(s):	RSS-247 Issue 2, RSS-GEN Issue 4
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02v02r01
Test Date:	February 08 ~ May 08, 2018

Reviewed By : (Kevin Guo)

Approved By : (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 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
1802WSU008-U4	Rev. 01	Initial report	05-15-2018	Valid

CONTENTS

§2.1033 General Information

Applicant:	Murata Manufacturing Co., Ltd.
Applicant Address:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan
Manufacturer:	Murata Manufacturing Co., Ltd.
Manufacturer Address:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	893164
IC Registration No.:	11384A-1
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Unlicensed National Information Infrastructure (NII)

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-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 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 atD8 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 September30, 2013.

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	Communication Module
Model No.:	LBEE5HY1MW
HVIN:	LBEE5HY1MW
Wi-Fi Specification:	802.11a/b/g/n/ac
Bluetooth Specification:	V4.2 dual mode
Operating Temperature:	-30 ~ 85 °C
Power Type:	DC 3.3V

2.2. Product Specification Subjective to this Report

Frequency Range	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	802.11a/n/ac: OFDM
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 150Mbps 802.11ac: up to 433.3Mbps
Maximum Average Output Power	802.11a: 14.82dBm 802.11n-HT20: 14.26dBm 802.11n-HT40: 13.78dBm 802.11ac-VHT20: 14.33dBm 802.11ac-VHT40: 13.77dBm 802.11ac-VHT80: 9.64dBm
Antenna Type:	PCB Antenna
Antenna Gain	-0.4dBi

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

2.3. Operation Frequency / Channel list

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

Note: The device can't operate in 5600~5650 MHz band in Canada (The frequency of blue font).

2.4. Test Mode

Test Mode	Mode 1: Transmit by 802.11a (6Mbps)
	Mode 2: Transmit by 802.11n-HT20 (MCS0)
	Mode 3: Transmit by 802.11n-HT40 (MCS0)
	Mode 4: Transmit by 802.11ac-VHT20 (MCS0)
	Mode 5: Transmit by 802.11ac-VHT40 (MCS0)
	Mode 6: Transmit by 802.11ac-VHT80 (MCS0)

Note: Refer to section 7.4.5, we choose the maximum power output at various data rates for final test of each channel.

2.5. Description of Test Software

The test utility software used during testing was “Tera Term”, and the version was “4.85”.

Power Parameter Value:

Test Mode	Test Channel No.	Test Frequency (MHz)	Power Parameter Value
802.11a	36	5180	48
	44	5220	60
	48	5240	60
	52	5260	60
	60	5300	48
	64	5320	48
	100	5500	48
	116	5580	60
	120	5600	60
	140	5700	48
	144	5720	48
	149	5745	48
	157	5785	60
	165	5825	48
802.11n-HT20	36	5180	48
	44	5220	60
	48	5240	60
	52	5260	60
	60	5300	48
	64	5320	48
	100	5500	48
	116	5580	60
	120	5600	60
	140	5700	48
	144	5720	48
	149	5745	48
	157	5785	60
	165	5825	48

802.11n-HT40	38	5190	40
	46	5230	60
	54	5270	60
	62	5310	40
	102	5510	40
	110	5550	60
	118	5590	60
	134	5670	40
	142	5710	40
	151	5755	40
	159	5795	40
802.11ac-VHT20	36	5180	48
	44	5220	60
	48	5240	60
	52	5260	60
	60	5300	48
	64	5320	48
	100	5500	48
	116	5580	60
	120	5600	60
	140	5700	48
	144	5720	48
	149	5745	48
	157	5785	60
	165	5825	48
802.11ac-VHT40	38	5190	40
	46	5230	60
	54	5270	60
	62	5310	40
	102	5510	40
	110	5550	60
	118	5590	60
	134	5670	40
	142	5710	40
	151	5755	40
	159	5795	40

802.11ac-VHT80	42	5210	40
	58	5290	40
	106	5530	40
	122	5610	40
	138	5690	40
	155	5775	40

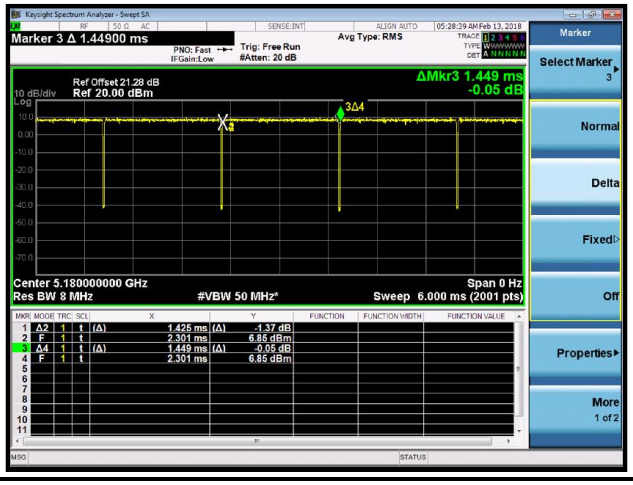
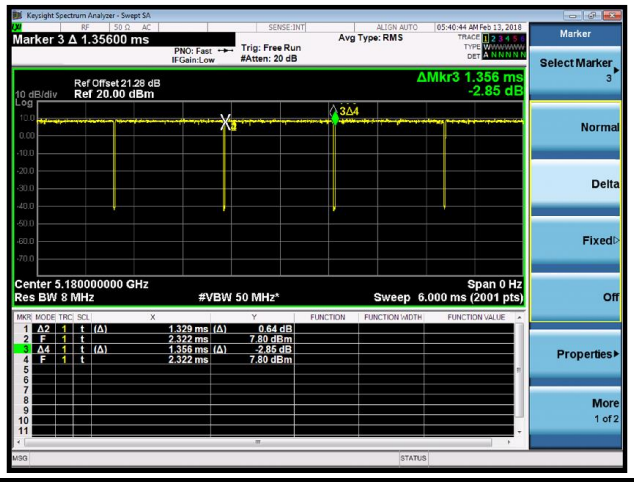
2.6. Device Capabilities

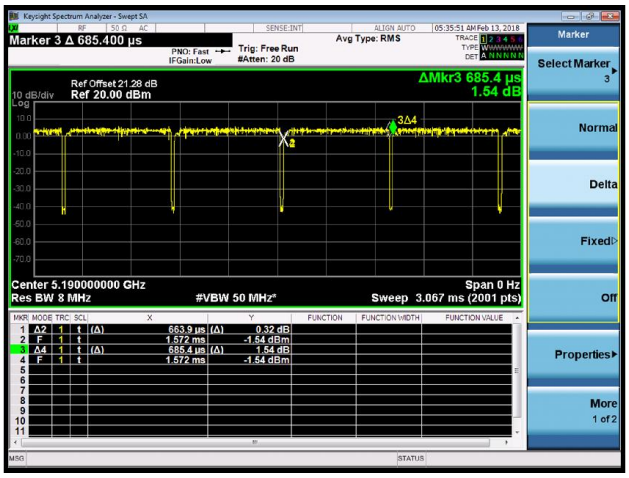
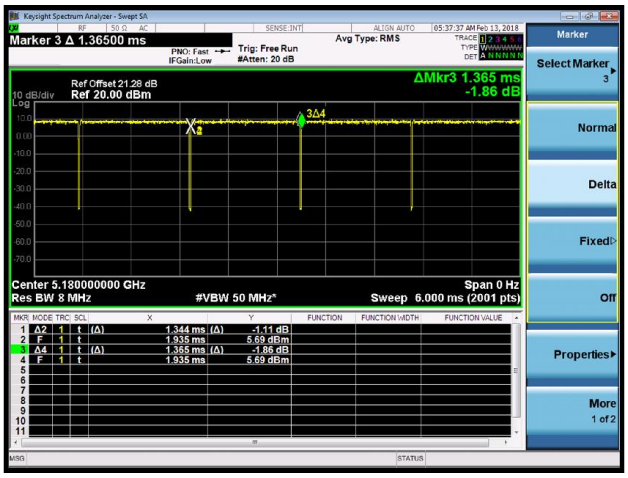
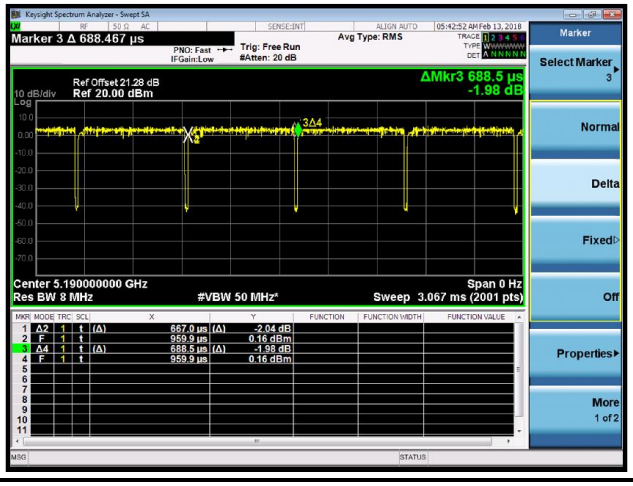
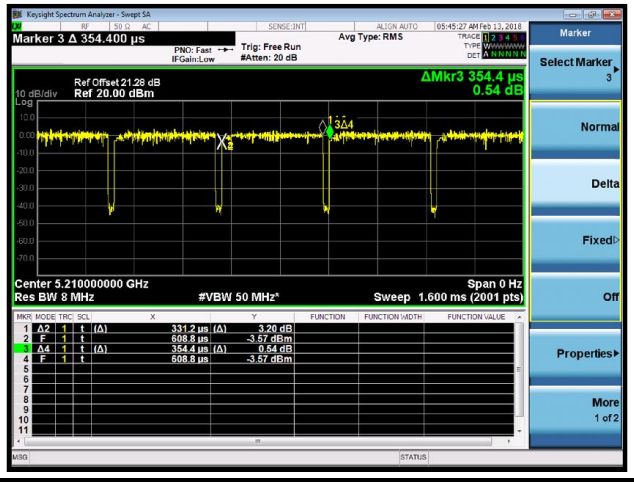
This device contains the following capabilities:

802.11a/b/g/n/ac W-LAN, Bluetooth V4.2 dual mode (BDR/EDR/LE) device.

Note: 5GHz (NII) operation is possible in 20MHz, 40MHzand 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = average per the guidance of Section B)2)b) of KDB 789033 D02v02r01. 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	98.34%
802.11n-HT20	98.01%
802.11n-HT40	96.86%
802.11ac-VHT20	98.46%
802.11ac-VHT40	96.88%
802.11ac-VHT80	93.45%

Duty Cycle (T = Transmission Duration)	
802.11a (T = 1.425ms)	802.11n-HT20 (T = 1.329ms)
	

802.11n-HT40 (T = 663.9us)	802.11ac-VHT20 (T = 1.344ms)
	
802.11ac-VHT40(T = 667.0us)	**802.11ac-VHT80 (T = 331.2us)**
	

2.7. Test Configuration

The **Communication Module** 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.

2.8. EMI Suppression Device(s)/Modifications

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

2.9. 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.

RSP-100 Issue 11 Section 3

The manufacturer, importer or distributor shall meet the labelling requirements set out in this section for every unit:

(i) prior to marketing in Canada, for products manufactured in Canada

(ii) prior to importation into Canada, for imported products

For information regarding the e-labelling option, see Notice 2014–DRS1003. The label for the certified product represents the manufacturer's or importer's compliance with Innovation, Science and Economic Development Canada's (ISED) regulatory requirements.

Please see attachment for IC 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 of the device**.**

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."

Conclusion:

The device 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	2018/04/24
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2018/06/21
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2018/06/21
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2018/08/14
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	1 year	2018/05/10

Radiated Emission - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2018/09/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2018/11/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2018/11/18
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2018/10/21
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2018/11/17
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2018/04/25
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2018/08/14
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	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	2019/04/20
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2018/12/06
Thermohygrometer	Testo	608-H1	MRTSUE06401	1 year	2018/08/14

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

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

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Frequency Stability - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power, Transmit Power Control - 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

Company Name: **Murata Manufacturing Co., Ltd.**
FCC ID: **VPYLBEE5HY1MW**
IC: **772C-LBEE5HY1MW**

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section7.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(iv), (2),(3)	Maximum Conducted Output Power	Refer to Section 7.4		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	≤ 24dBm		N/A	Section 7.5
15.407(a)(1)(iv), (2), (3), (5)	Peak Power Spectral Density	Refer to Section 7.6		Pass	Section 7.6
15.407(g)	Frequency Stability	N/A		Pass	Section 7.7
15.407(b)(1), (2), (3), (4)(i)	Undesirable Emissions	≤ -27dBm/MHz EIRP Detail see section 7.8	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 in15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	N/A	Section 7.10

RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
RSS-247§6.2	99% Bandwidth	N/A	Conducted	Pass	Section 7.2
RSS-247§6.2.4	6dB Bandwidth	>500kHz		Pass	Section 7.3
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Max Conducted Output Power	Refer to Section 7.4		Pass	Section 7.4
	Maximum E.I.R.P				
RSS-247 §6.2.2,§6.2.3	Transmit Power Control	≤ 24dBm		N/A	Section 7.5
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Peak Power Spectral Density	Refer to Section 7.6		Pass	Section 7.6
RSS-Gen [8.11]	Frequency Stability	N/A		Pass	Section 7.7
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Out-of-Band Emissions	≤ -27dBm/MHz EIRP	Radiated	Pass	Section 7.8&7.9
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in RSS-Gen [8.9]		Pass	
RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	< RSS-Gen [8.8] limits	Line Conducted	N/A	Section 7.10

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

7.2. 26dB Bandwidth Measurement

7.2.1.Test Limit

N/A

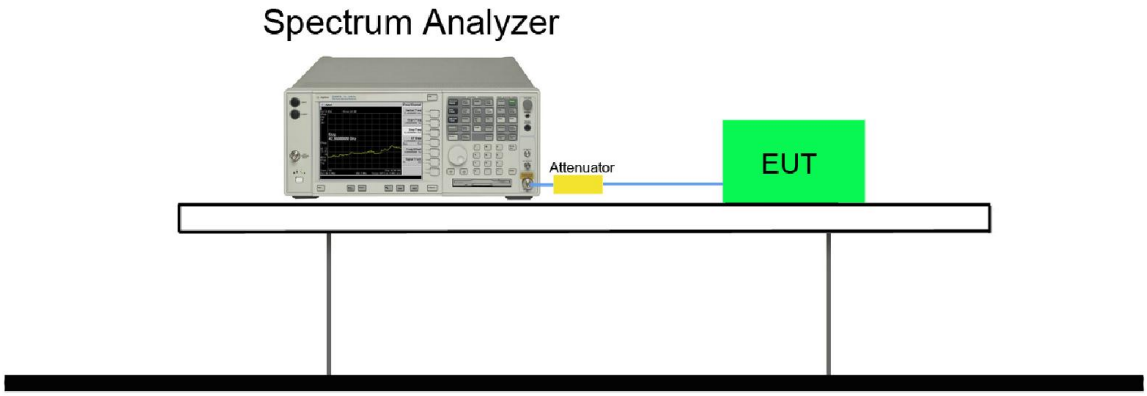
7.2.2.Test Procedure used

KDB 789033 D02v02r01 – Section C.1

7.2.3.Test Setting

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

7.2.4.Test Setup



7.2.5.Test Result

Product	Communication Module	Temperature	24°C
Test Engineer	Hunk Li	Relative Humidity	53%
Test Site	TR3	Test Date	2018/02/23
Test Item	26dB Bandwidth		

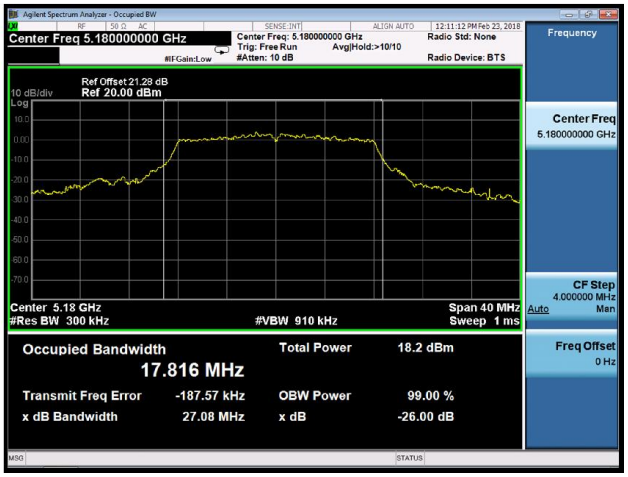
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a	6Mbps	36	5180	27.08	17.82
802.11a	6Mbps	44	5220	33.63	18.51
802.11a	6Mbps	48	5240	33.72	18.50
802.11a	6Mbps	52	5260	33.49	18.30
802.11a	6Mbps	60	5300	26.84	17.76
802.11a	6Mbps	64	5320	26.62	17.56
802.11a	6Mbps	100	5500	21.28	16.84
802.11a	6Mbps	116	5580	28.61	17.47
802.11a	6Mbps	120	5600	28.63	17.58
802.11a	6Mbps	140	5700	21.63	16.93
802.11a	6Mbps	144	5720	22.76	17.09
802.11a	6Mbps	149	5745	23.64	17.12
802.11a	6Mbps	157	5785	29.43	17.79
802.11a	6Mbps	165	5825	24.35	17.14
802.11n-HT20	MCS0	36	5180	21.85	18.02
802.11n-HT20	MCS0	44	5220	24.58	18.11
802.11n-HT20	MCS0	48	5240	22.59	18.12
802.11n-HT20	MCS0	52	5260	25.49	18.02
802.11n-HT20	MCS0	60	5300	22.08	18.06
802.11n-HT20	MCS0	64	5320	21.52	17.96
802.11n-HT20	MCS0	100	5500	21.67	17.92
802.11n-HT20	MCS0	116	5580	29.32	18.49
802.11n-HT20	MCS0	120	5600	27.27	18.43
802.11n-HT20	MCS0	140	5700	21.54	17.92
802.11n-HT20	MCS0	144	5720	21.48	17.88
802.11n-HT20	MCS0	149	5745	22.09	17.93
802.11n-HT20	MCS0	157	5785	29.19	18.30
802.11n-HT20	MCS0	165	5825	22.27	18.03

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11n-HT40	MCS0	38	5190	49.22	36.52
802.11n-HT40	MCS0	46	5230	72.43	37.89
802.11n-HT40	MCS0	54	5270	73.15	37.90
802.11n-HT40	MCS0	62	5310	40.00	36.31
802.11n-HT40	MCS0	102	5510	39.99	36.24
802.11n-HT40	MCS0	110	5550	71.77	37.54
802.11n-HT40	MCS0	118	5590	73.72	37.61
802.11n-HT40	MCS0	134	5670	40.01	36.24
802.11n-HT40	MCS0	142	5710	40.04	36.26
802.11n-HT40	MCS0	151	5755	39.99	36.26
802.11n-HT40	MCS0	159	5795	39.90	36.29
802.11ac-VHT20	MCS0	36	5180	22.02	17.91
802.11ac-VHT20	MCS0	44	5220	25.93	18.22
802.11ac-VHT20	MCS0	48	5240	27.24	18.23
802.11ac-VHT20	MCS0	52	5260	25.41	18.24
802.11ac-VHT20	MCS0	60	5300	22.11	17.94
802.11ac-VHT20	MCS0	64	5320	22.06	17.90
802.11ac-VHT20	MCS0	100	5500	22.00	17.94
802.11ac-VHT20	MCS0	116	5580	28.62	18.43
802.11ac-VHT20	MCS0	120	5600	27.65	18.22
802.11ac-VHT20	MCS0	140	5700	22.03	17.99
802.11ac-VHT20	MCS0	144	5720	21.89	17.93
802.11ac-VHT20	MCS0	149	5745	22.23	17.97
802.11ac-VHT20	MCS0	157	5785	30.42	18.39
802.11ac-VHT20	MCS0	165	5825	21.94	18.00

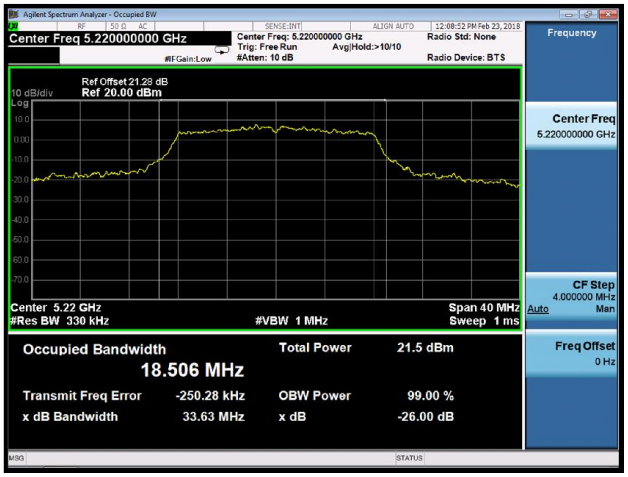
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac-VHT40	MCS0	38	5190	39.87	36.27
802.11ac-VHT40	MCS0	46	5230	62.61	37.29
802.11ac-VHT40	MCS0	54	5270	62.59	37.17
802.11ac-VHT40	MCS0	62	5310	40.02	36.28
802.11ac-VHT40	MCS0	102	5510	39.90	36.27
802.11ac-VHT40	MCS0	110	5550	61.34	37.04
802.11ac-VHT40	MCS0	118	5590	61.62	36.99
802.11ac-VHT40	MCS0	134	5670	39.83	36.24
802.11ac-VHT40	MCS0	142	5710	39.99	36.22
802.11ac-VHT40	MCS0	151	5755	39.86	36.29
802.11ac-VHT40	MCS0	159	5795	40.16	36.23
802.11ac-VHT80	MCS0	42	5210	97.61	75.69
802.11ac-VHT80	MCS0	58	5290	87.92	75.74
802.11ac-VHT80	MCS0	106	5530	81.77	75.70
802.11ac-VHT80	MCS0	122	5610	82.43	75.87
802.11ac-VHT80	MCS0	138	5690	81.90	75.77
802.11ac-VHT80	MCS0	155	5775	82.00	75.74

802.11a 26dB Bandwidth & 99% Bandwidth

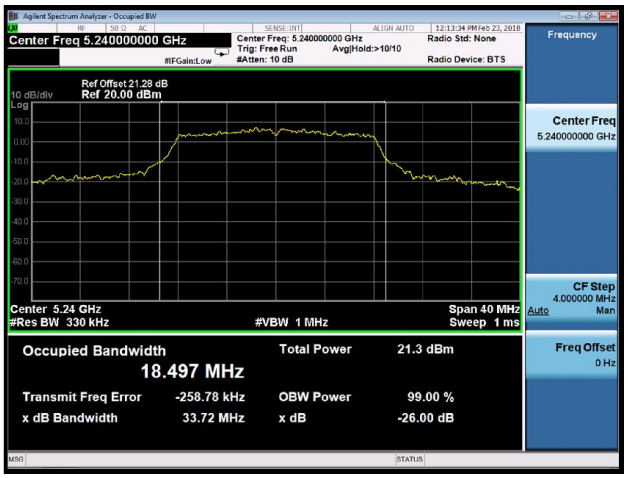
Channel 36 (5180MHz)



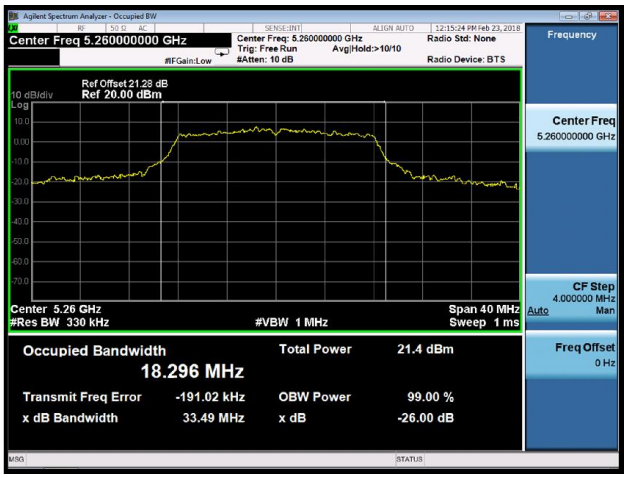
Channel 44 (5220MHz)



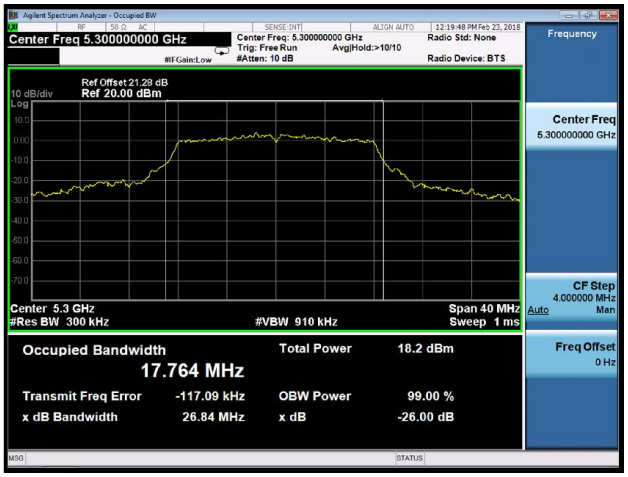
Channel 48 (5240MHz)



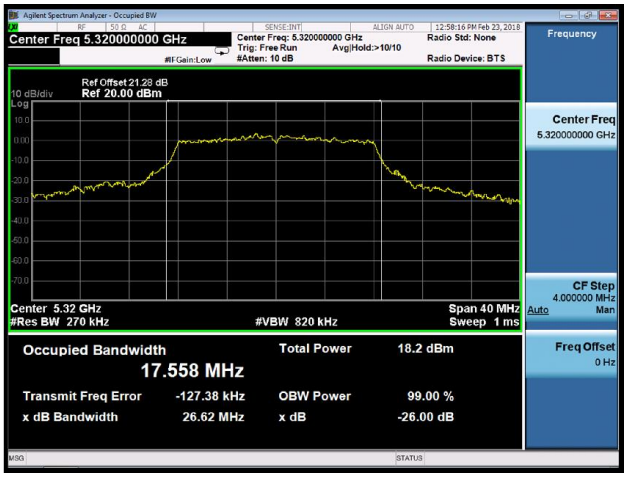
Channel 52 (5260MHz)



Channel 60 (5300MHz)

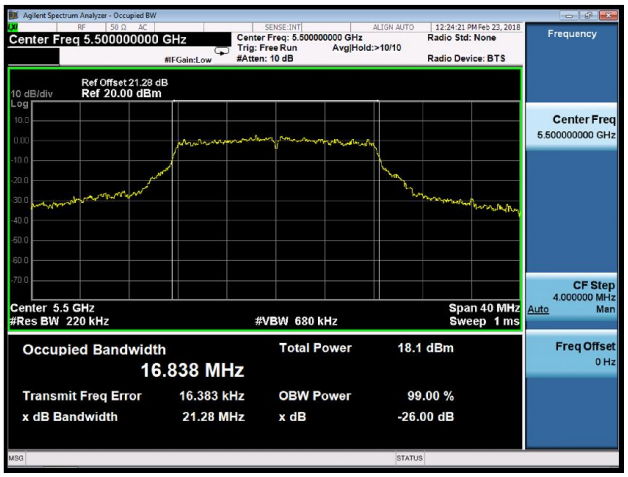


Channel 64 (5320MHz)

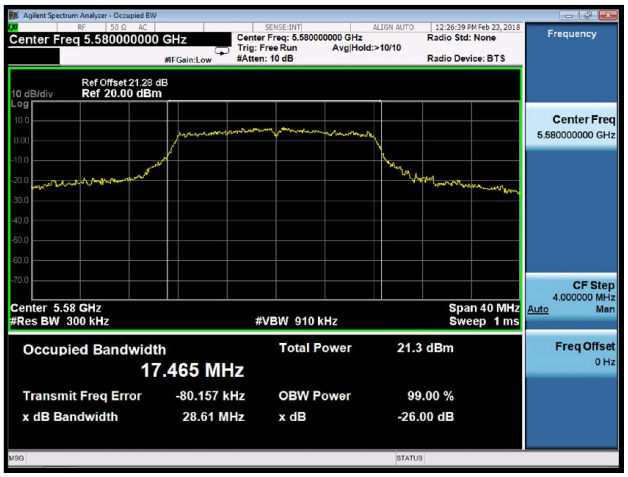


802.11a 26dB Bandwidth & 99% Bandwidth

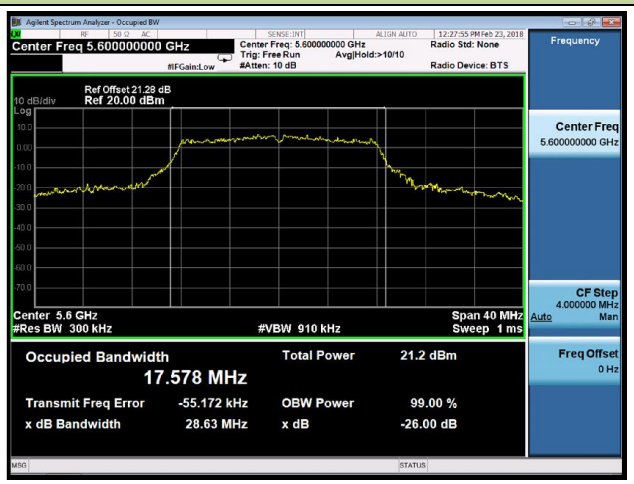
Channel 100 (5500MHz)



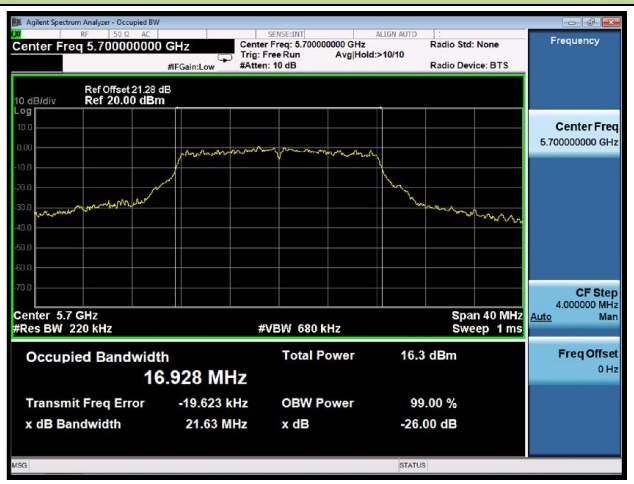
Channel 116 (5580MHz)



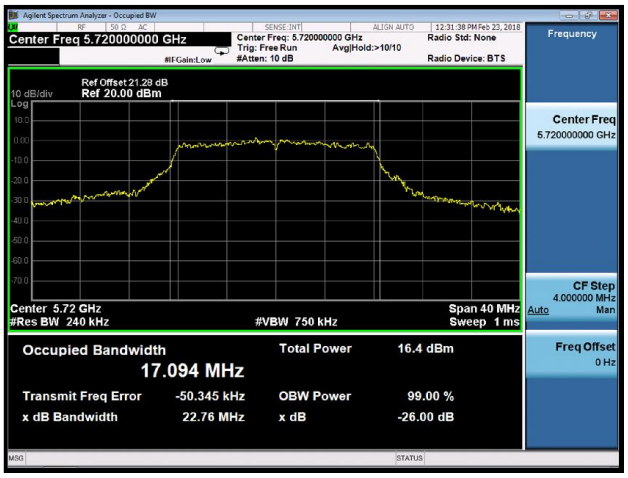
Channel 120 (5600MHz)



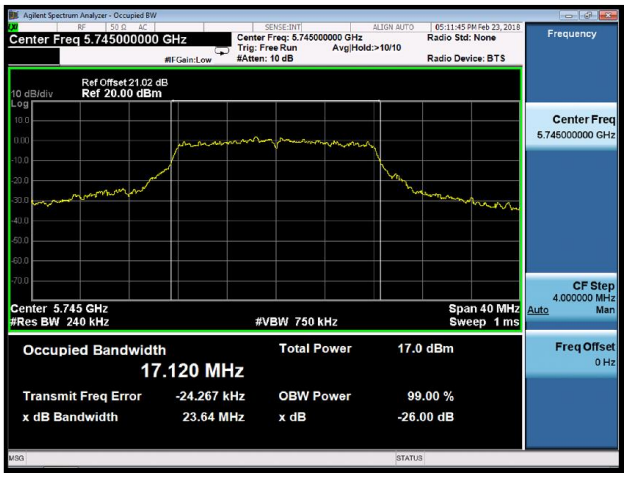
Channel 140 (5700MHz)

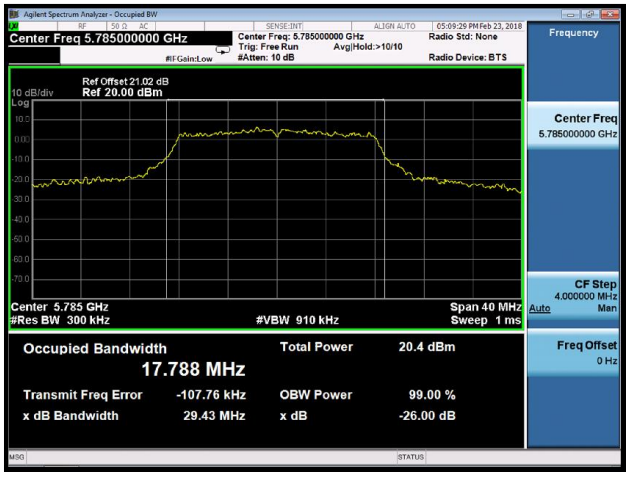
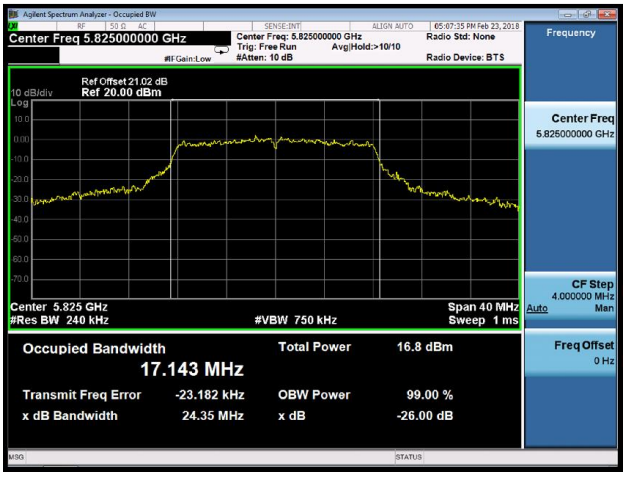


Channel 144 (5720MHz)



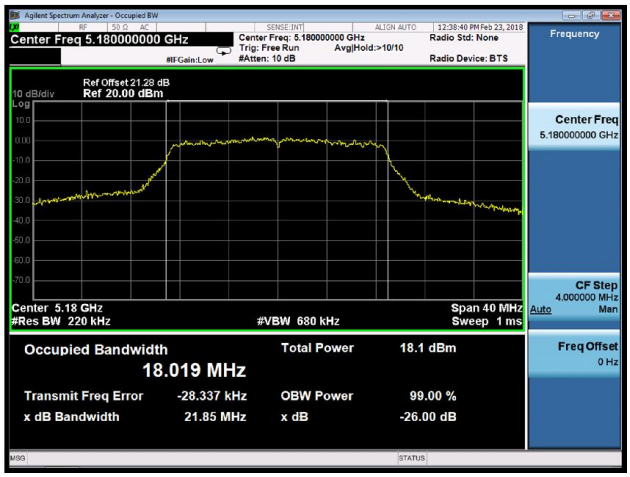
Channel 149 (5745MHz)



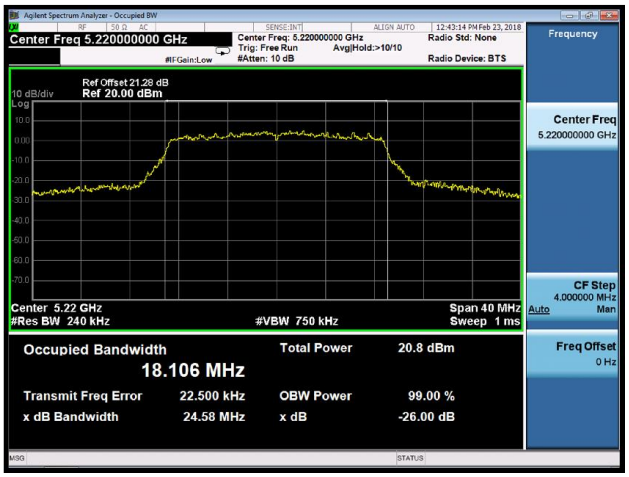
802.11a 26dB Bandwidth & 99% Bandwidth	
Channel 157 (5785MHz)	**Channel 165 (5825MHz)**
	

802.11n-HT20 26dB Bandwidth & 99% Bandwidth

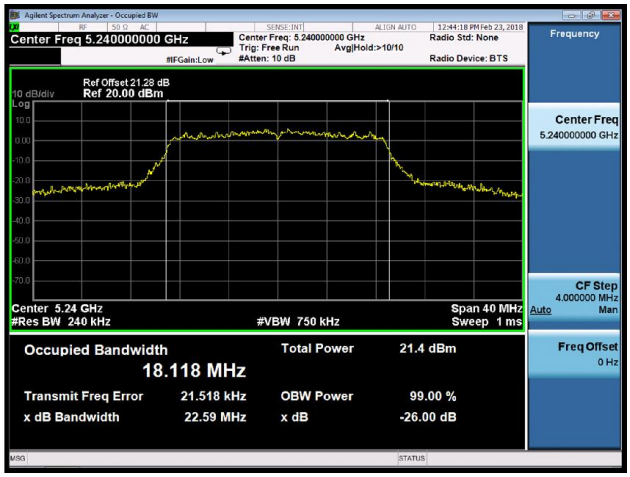
Channel 36 (5180MHz)



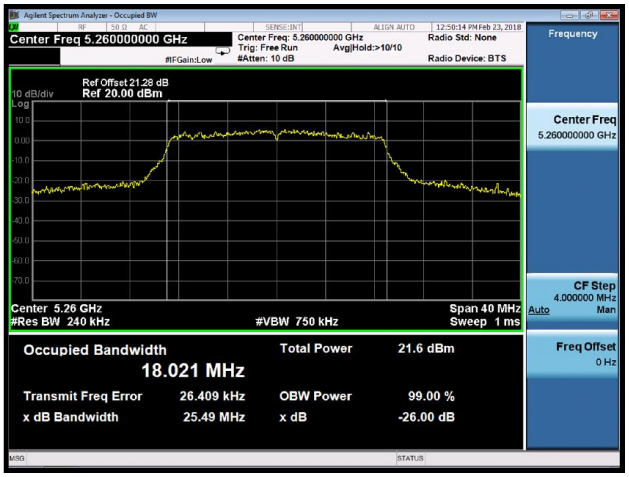
Channel 44 (5220MHz)



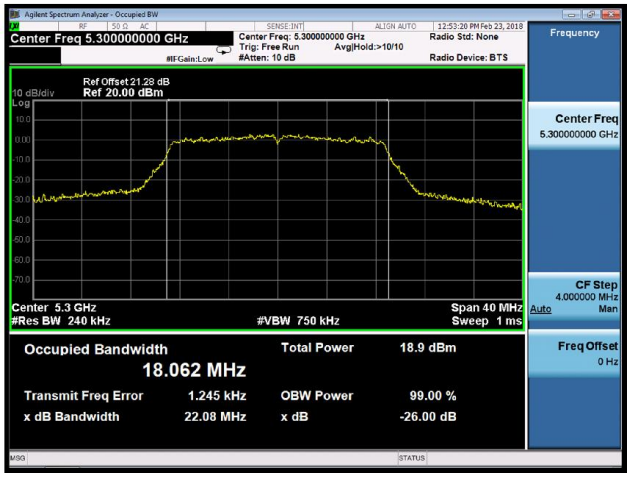
Channel 48 (5240MHz)



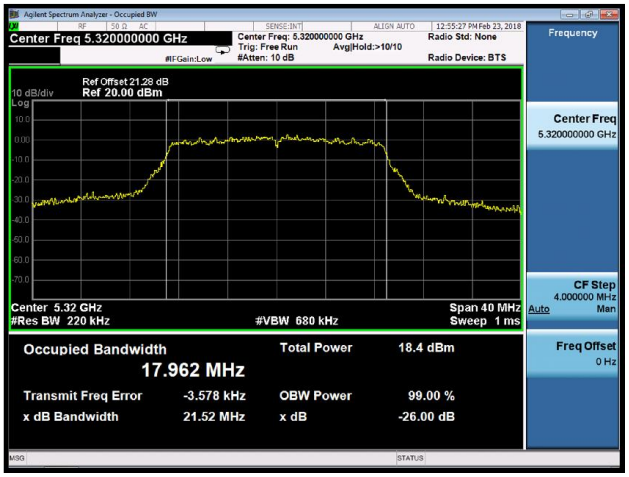
Channel 52 (5260MHz)



Channel 60 (5300MHz)

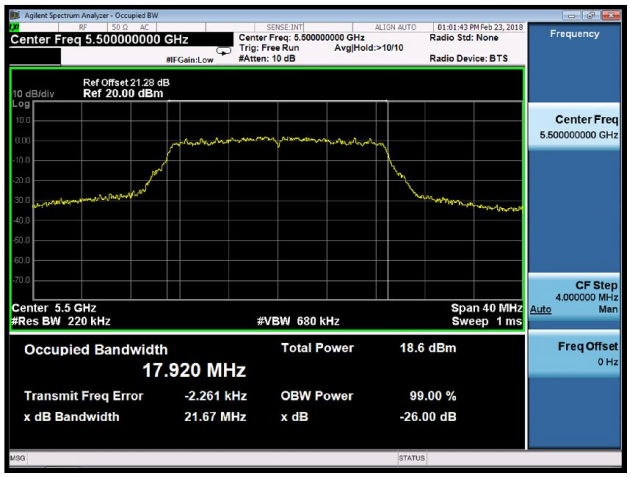


Channel 64 (5320MHz)

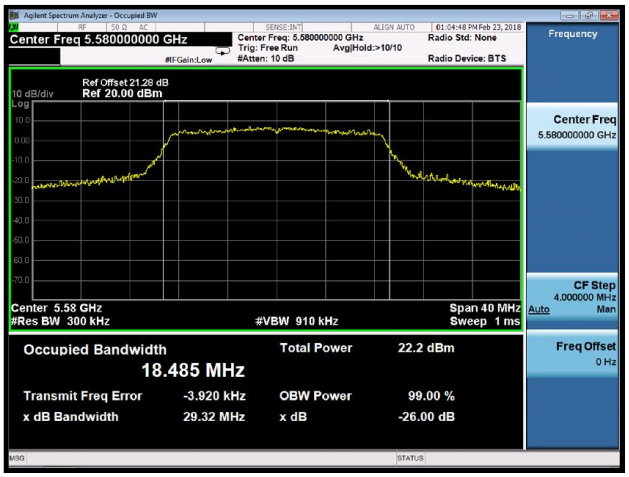


802.11n-HT20 26dB Bandwidth & 99% Bandwidth

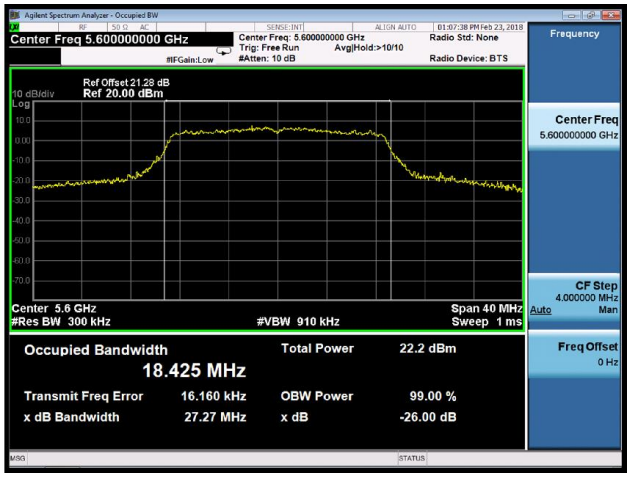
Channel 100 (5500MHz)



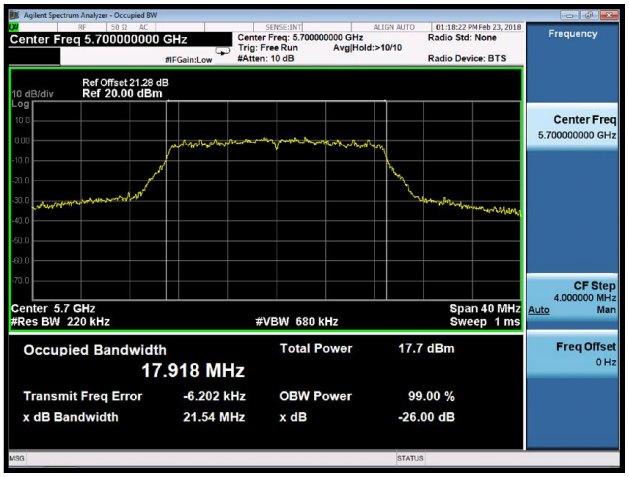
Channel 116 (5580MHz)



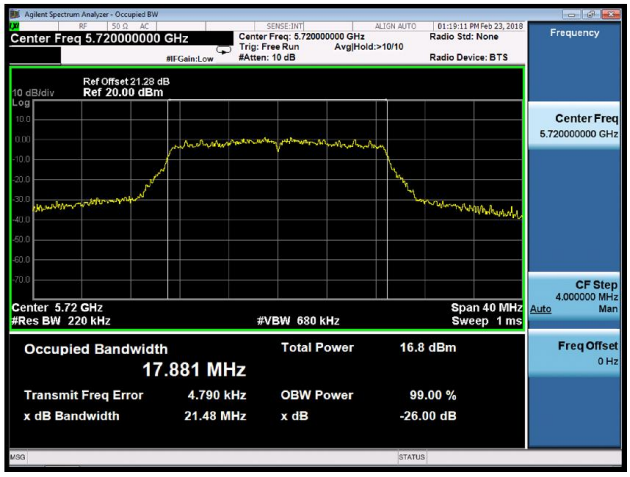
Channel 120 (5600MHz)



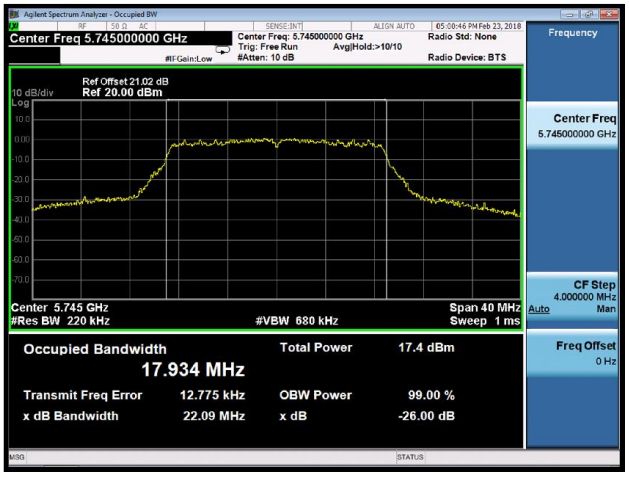
Channel 140 (5700MHz)

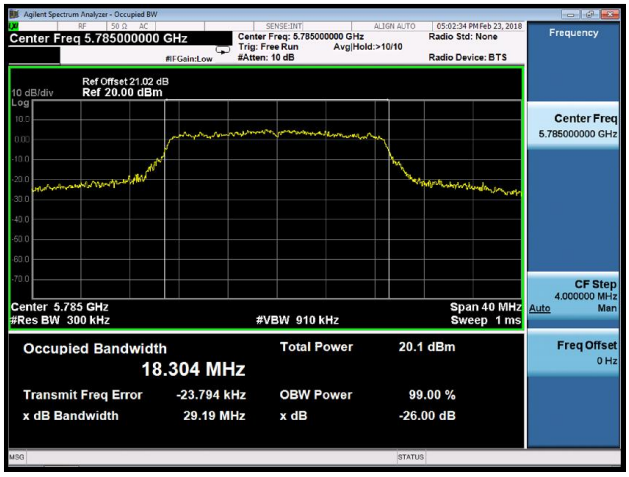
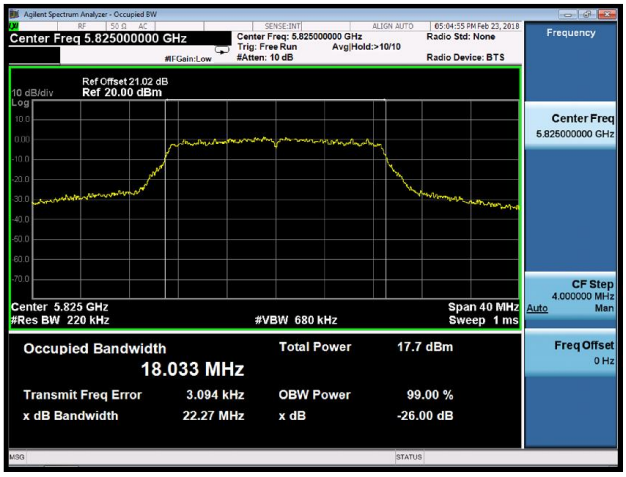


Channel 144 (5720MHz)



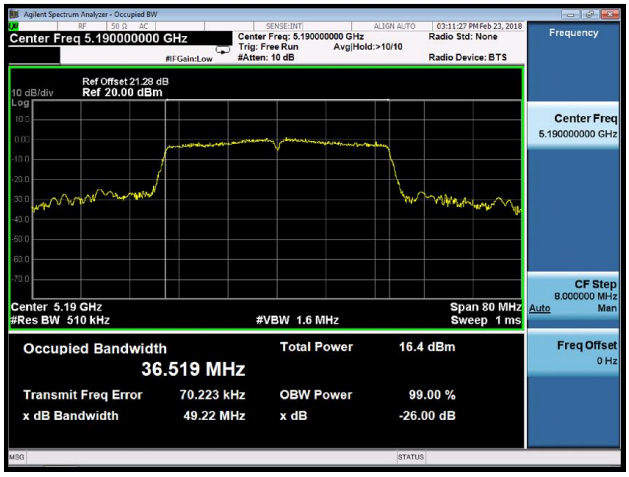
Channel 149 (5745MHz)



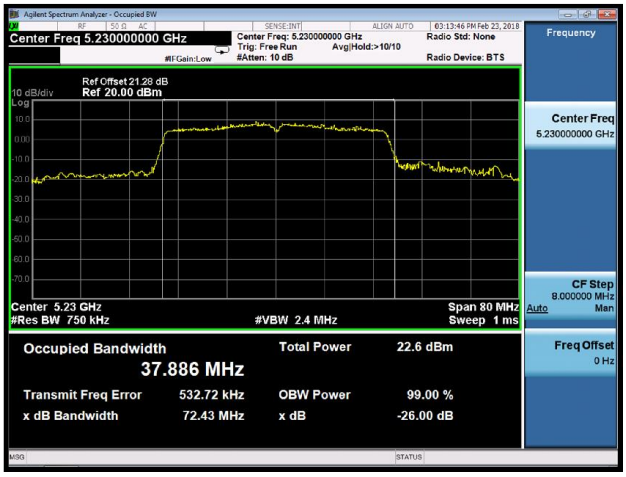
802.11n-HT20 26dB Bandwidth & 99% Bandwidth	
Channel 157 (5785MHz)	**Channel 165 (5825MHz)**
	

802.11n-HT40 26dB Bandwidth & 99% Bandwidth

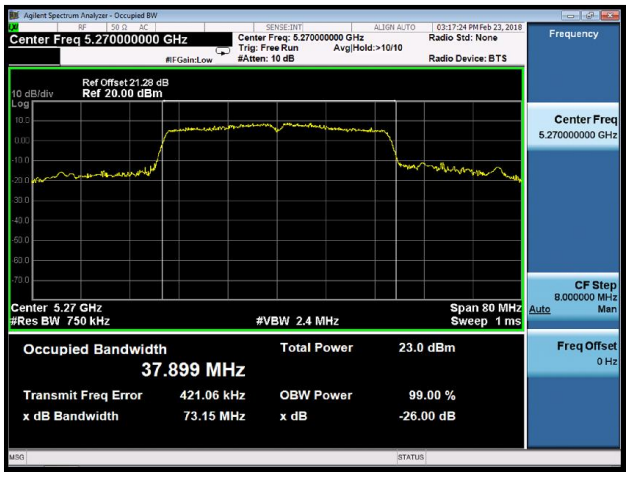
Channel 38 (5190MHz)



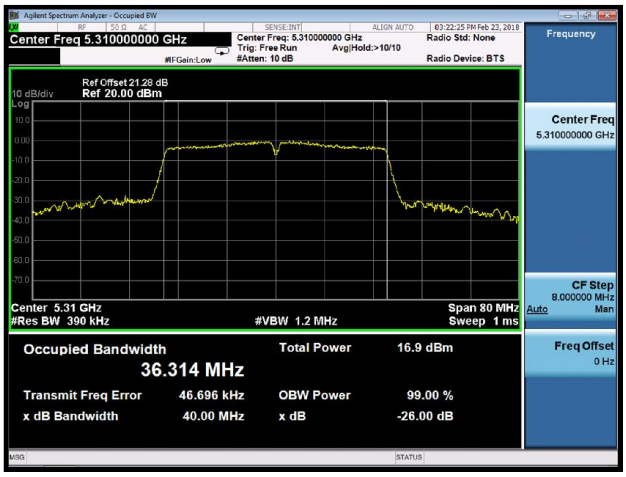
Channel 46 (5230MHz)



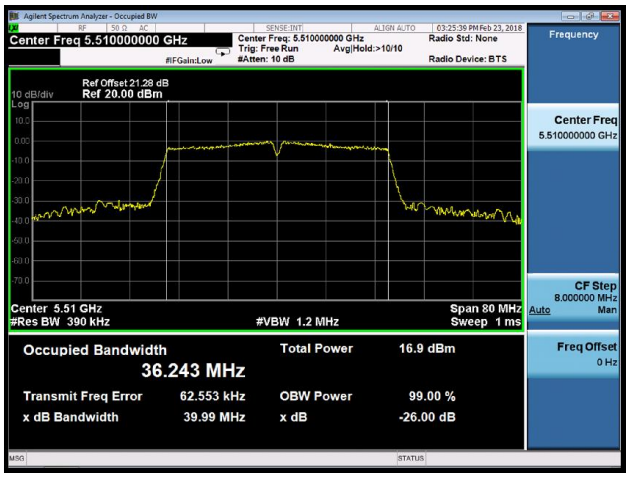
Channel 54 (5270MHz)



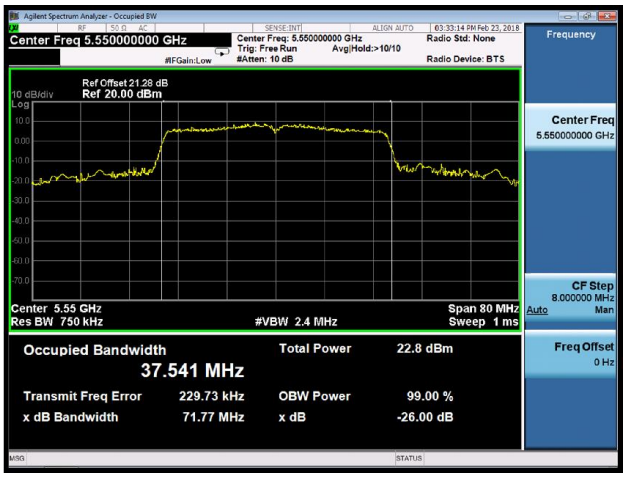
Channel 62 (5310MHz)



Channel 102 (5510MHz)

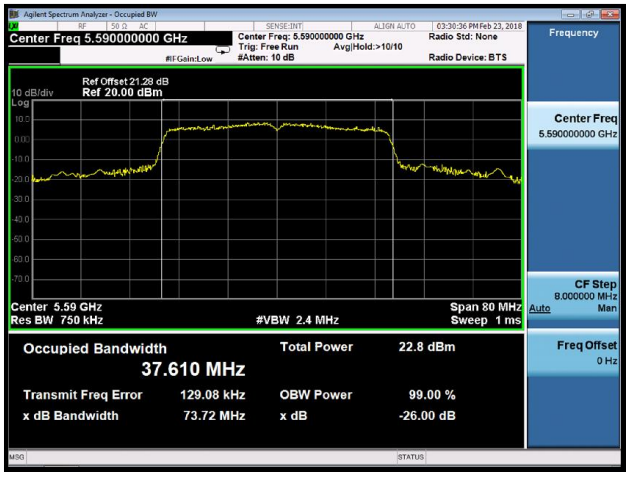


Channel 110 (5550MHz)

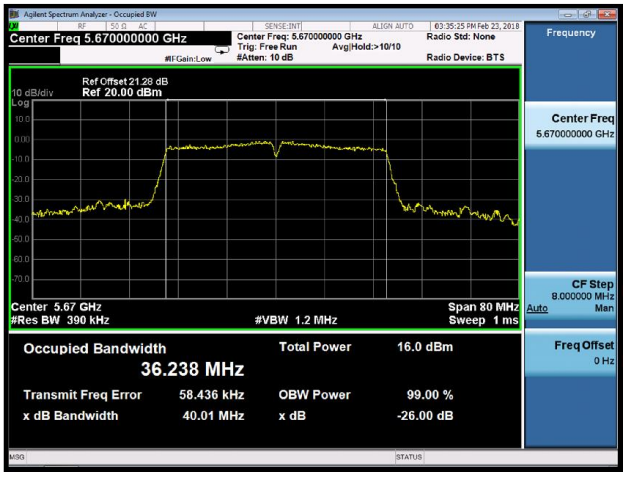


802.11n-HT40 26dB Bandwidth & 99% Bandwidth

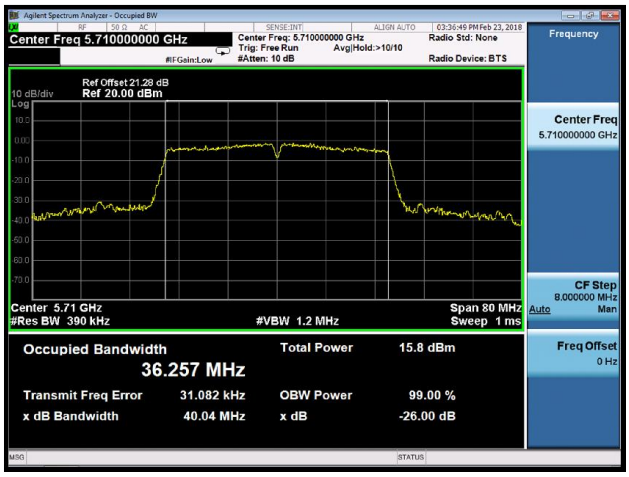
Channel 118 (5590MHz)



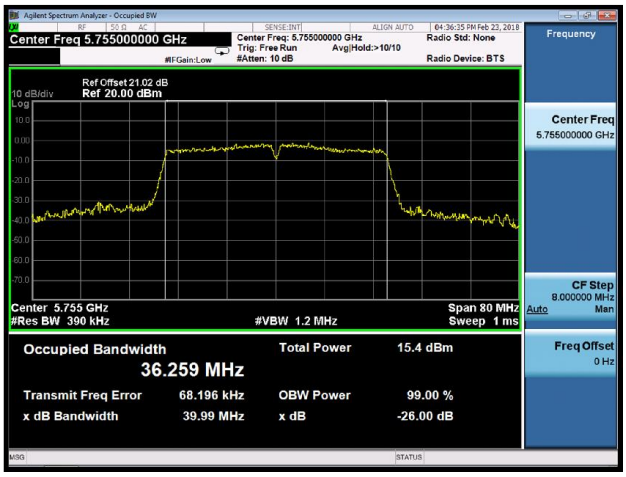
Channel 134 (5670MHz)



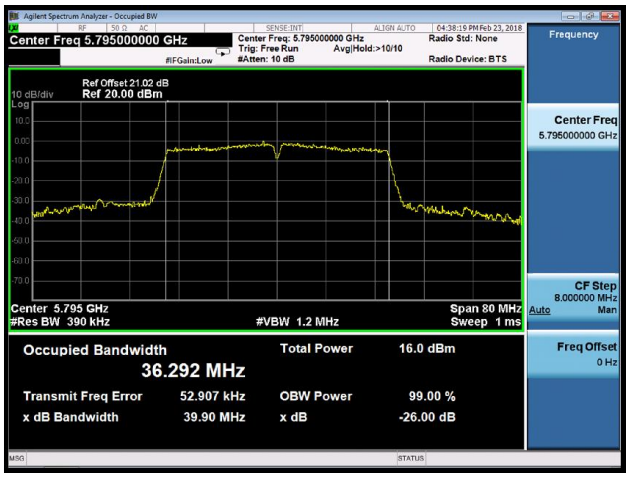
Channel 142 (5710MHz)



Channel 151 (5755MHz)

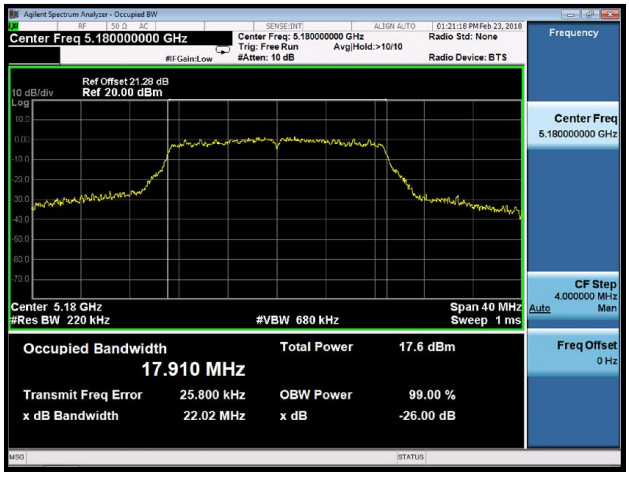


Channel 159 (5795MHz)

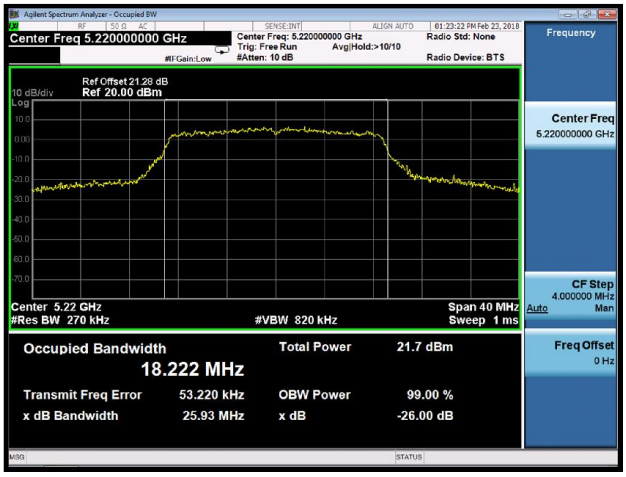


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth

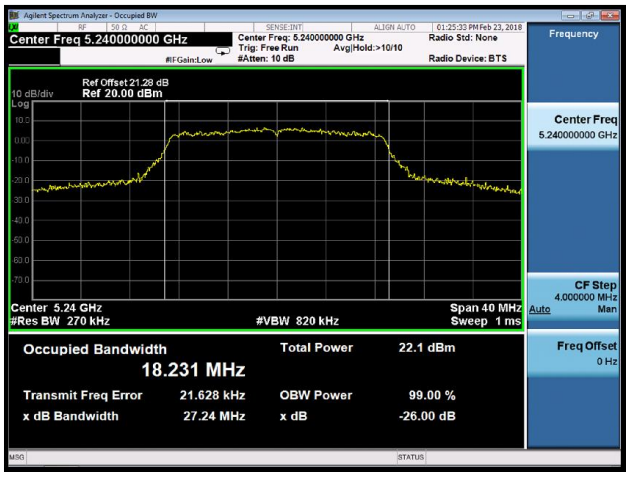
Channel 36 (5180MHz)



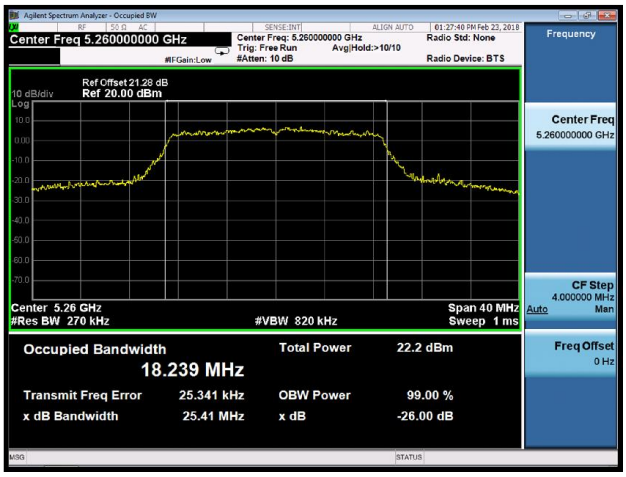
Channel 44 (5220MHz)



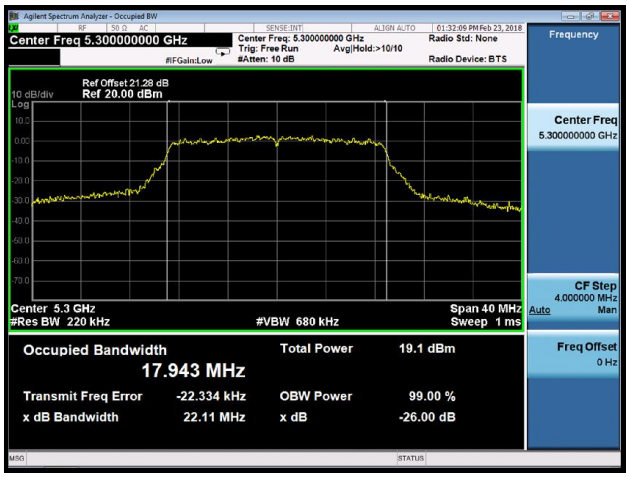
Channel 48 (5240MHz)



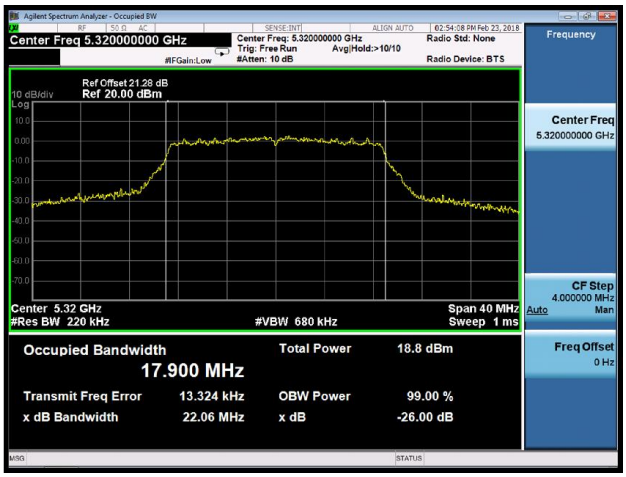
Channel 52 (5260MHz)



Channel 60 (5300MHz)

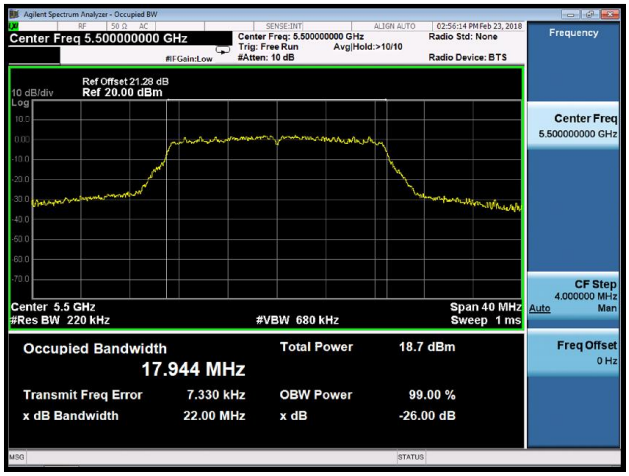


Channel 64 (5320MHz)

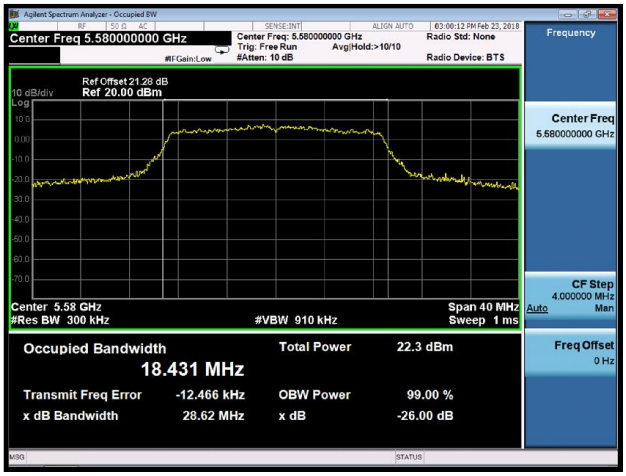


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth

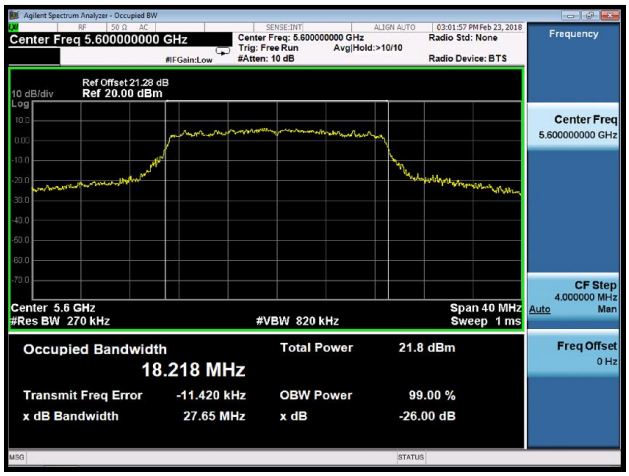
Channel 100 (5500MHz)



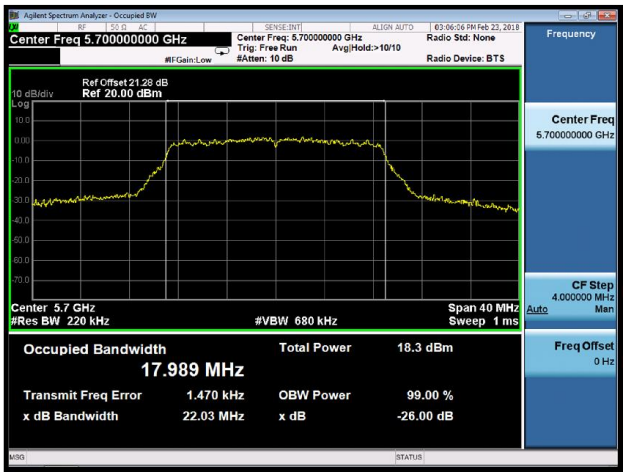
Channel 116 (5580MHz)



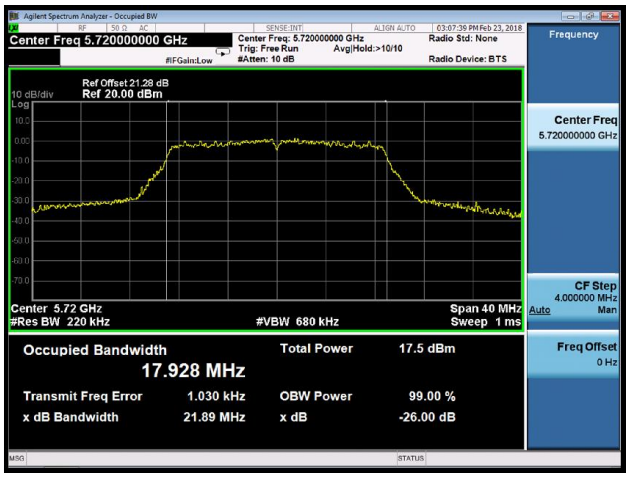
Channel 120 (5600MHz)



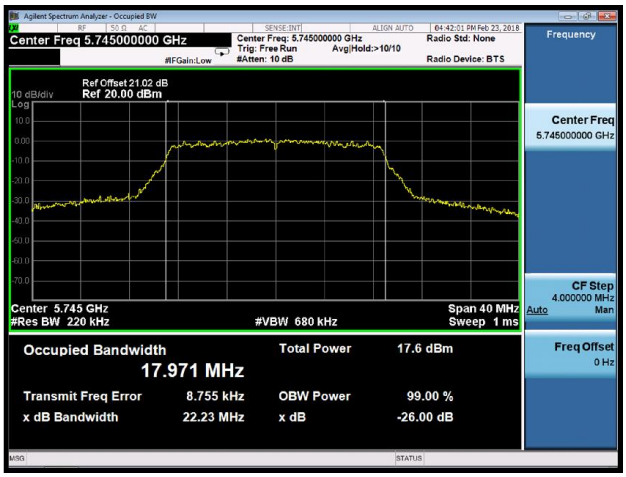
Channel 140 (5700MHz)

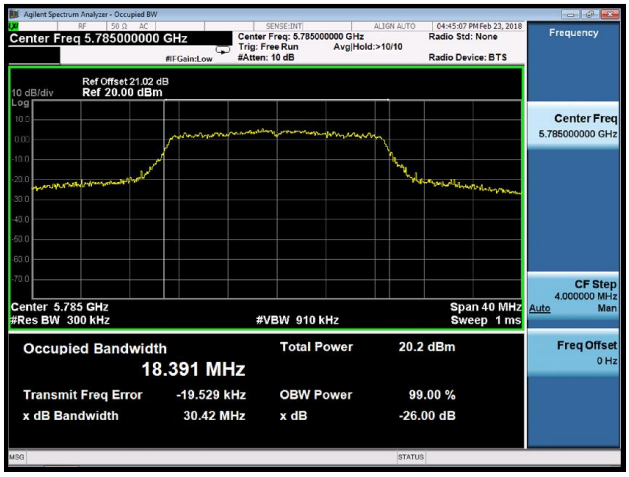
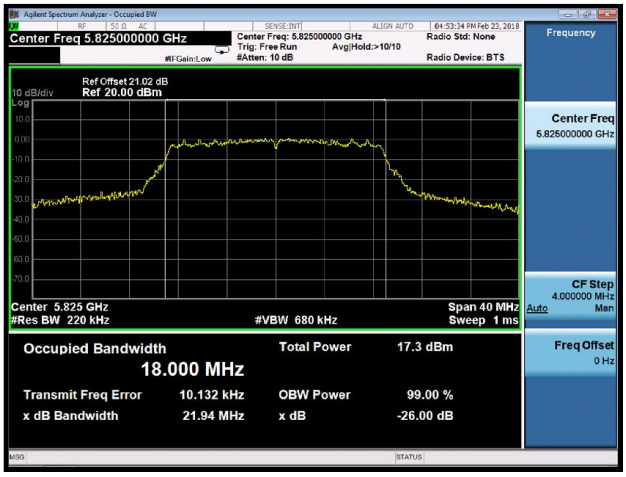


Channel 144 (5720MHz)



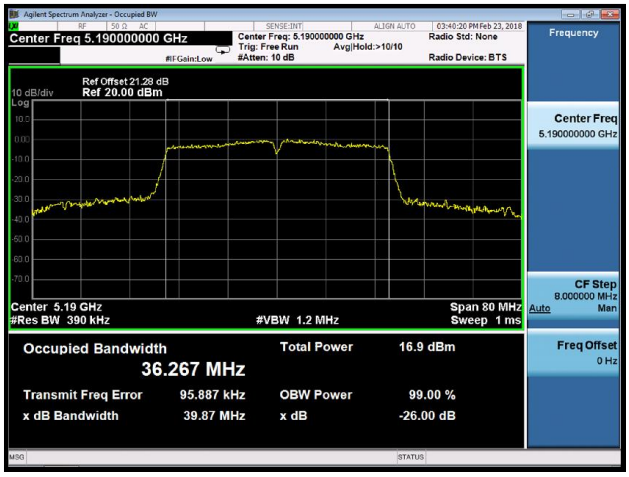
Channel 149 (5745MHz)



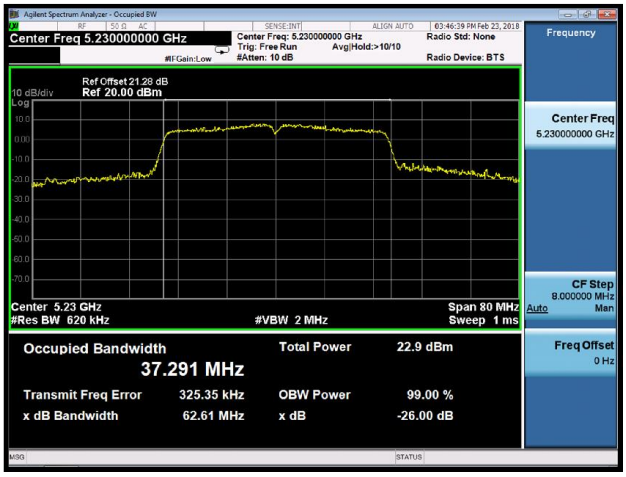
802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth	
Channel 157 (5785MHz)	**Channel 165 (5825MHz)**
	

802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth

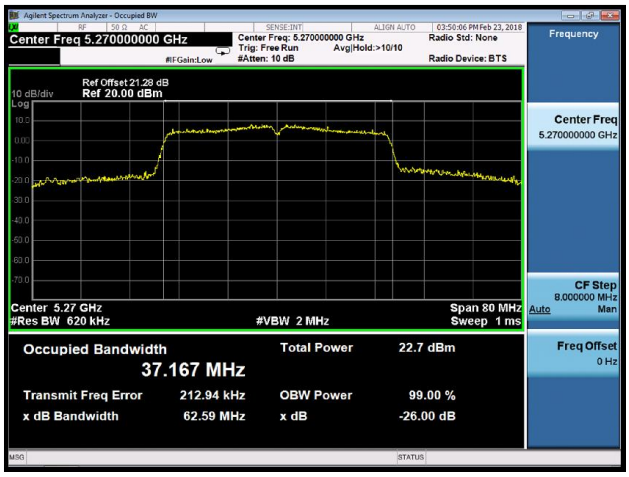
Channel 38 (5190MHz)



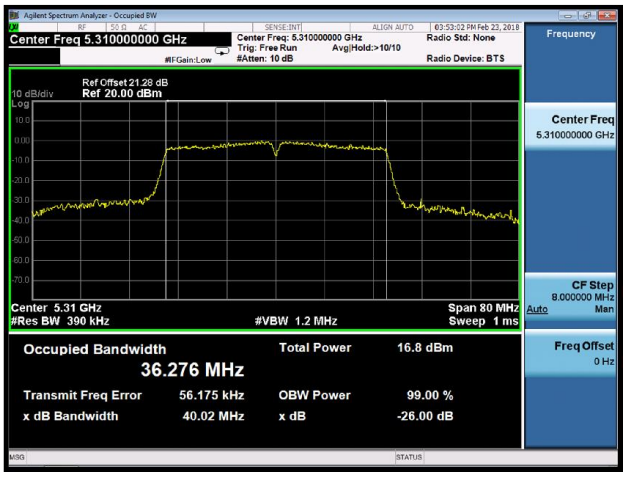
Channel 46 (5230MHz)



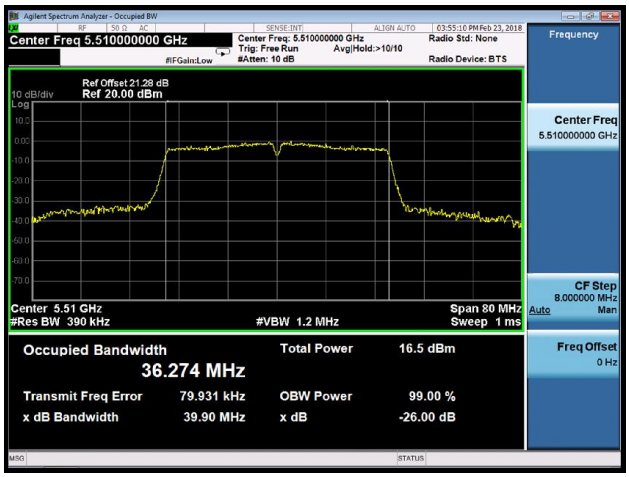
Channel 54 (5270MHz)



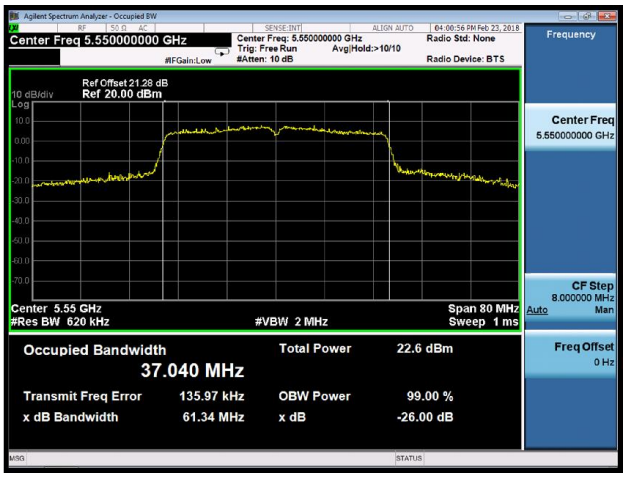
Channel 62 (5310MHz)



Channel 102 (5510MHz)

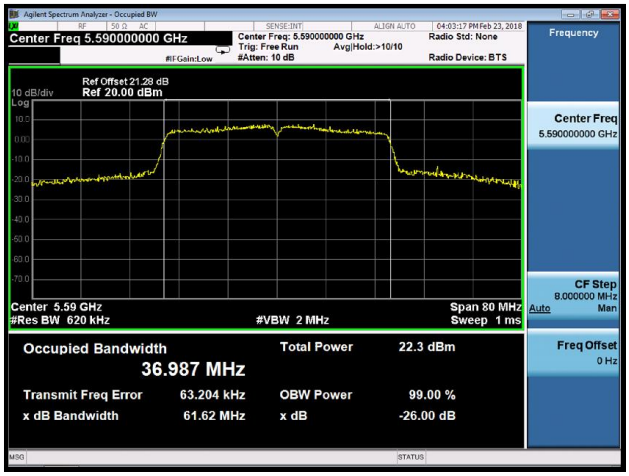


Channel 110 (5550MHz)

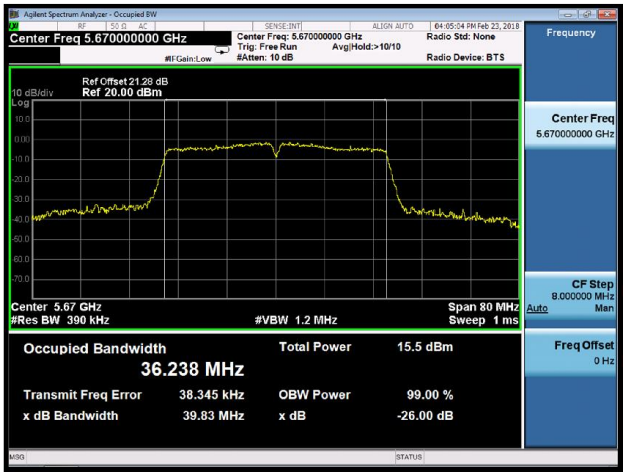


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth

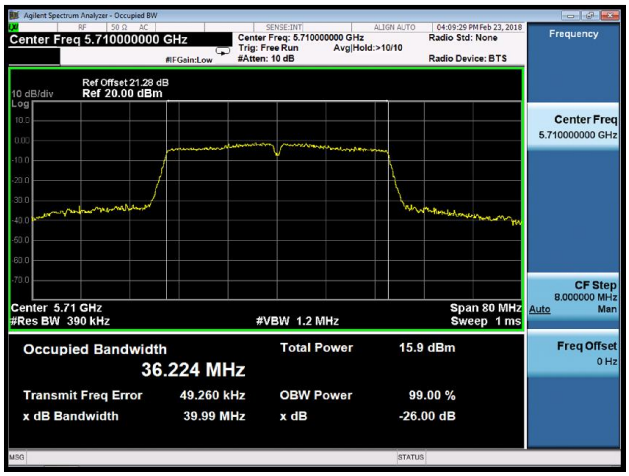
Channel 118 (5590MHz)



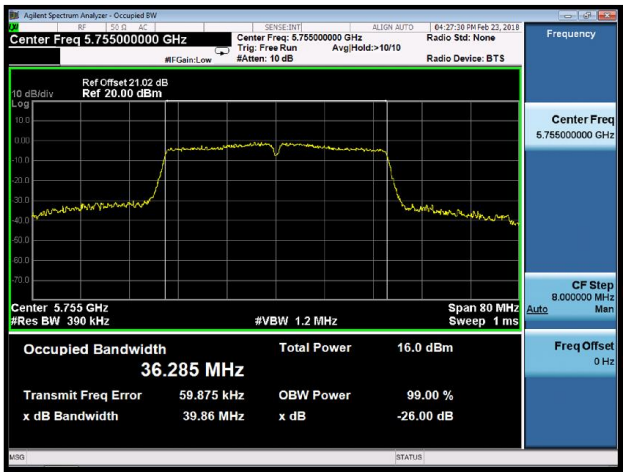
Channel 134 (5670MHz)



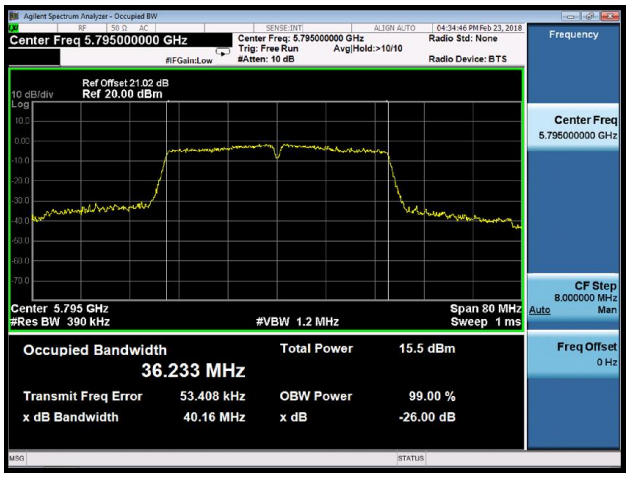
Channel 142 (5710MHz)



Channel 151 (5755MHz)

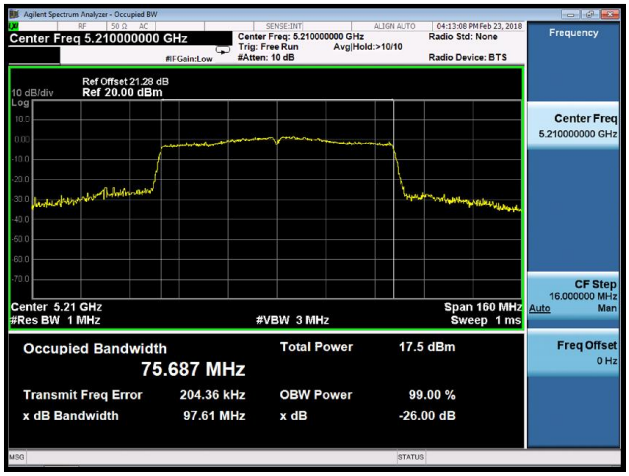


Channel 159 (5795MHz)

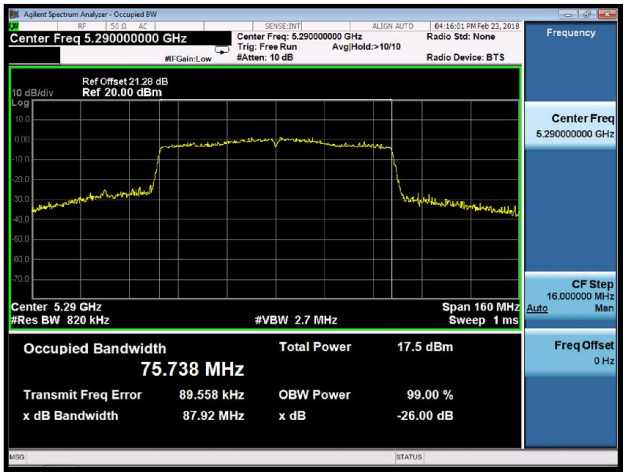


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth

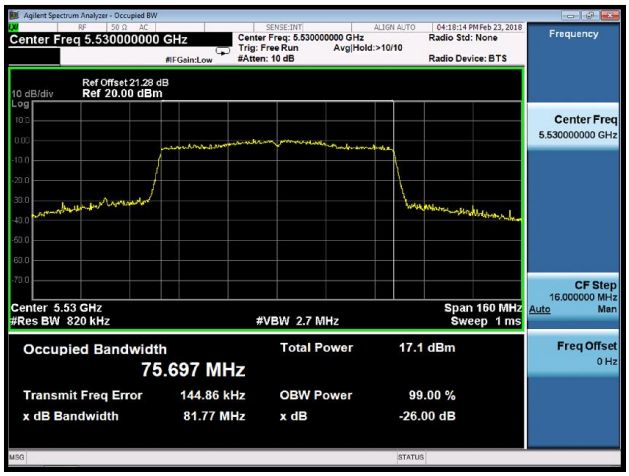
Channel 42 (5210MHz)



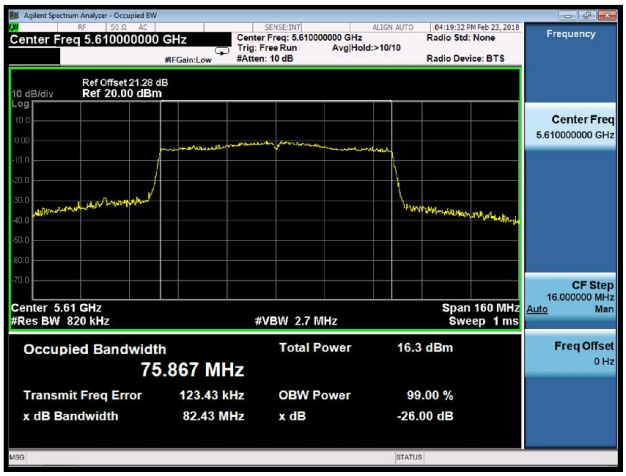
Channel 58 (5290MHz)



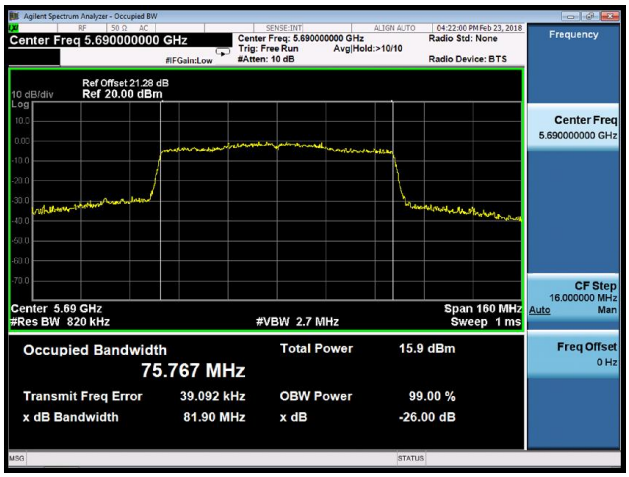
Channel 106 (5530MHz)



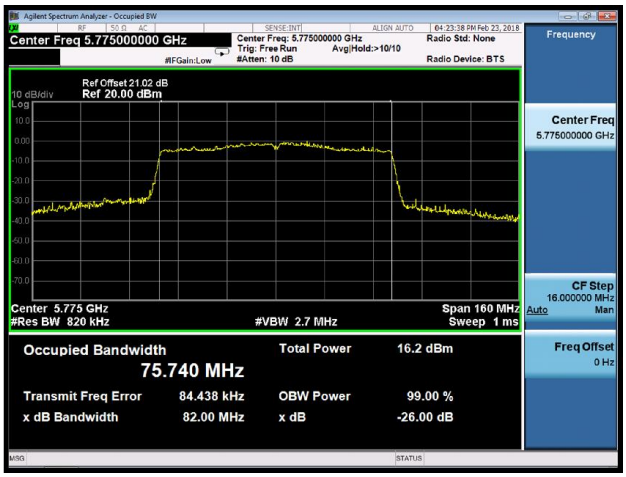
Channel 122 (5610MHz)



Channel 138 (5690MHz)



Channel 155 (5775MHz)



7.3. 6dB Bandwidth Measurement

7.3.1.Test Limit

The minimum 6dBbandwidth shall be at least 500 kHz.

7.3.2.Test Procedure used

KDB 789033 D02v02r01 – 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