

# TEST REPORT



**DT&C Co., Ltd.**

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042  
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1705-0078

2. Customer

- Name : HYUNDAI MOBIS CO., LTD.
- Address : 203 Teheran-ro, Gangnam-gu, Seoul, South Korea, 135-977

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : DIGITAL CAR AVN SYSTEM / ADC30C6AN  
FCC ID : TQ8-ADC30C6AN

5. Test Method Used : KDB 789033, ANSI C63.10-2013

Test Specification : FCC Part 15.407 Subpart E

6. Date of Test : 2017.03.03 ~ 2017.04.18

7. Testing Environment : See appended test report.

8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : JaeHyeok Bang	(Signature)	Technical Manager Name : WonJung Lee	(Signature)
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The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2017 . 05 . 16 .

**DT&C Co., Ltd.**

If this report is required to confirmation of authenticity, please contact to [report@dtnc.net](mailto:report@dtnc.net)

## Test Report Version

<b>Test Report No.</b>	<b>Date</b>	<b>Description</b>
DRTFCC1705-0078	May, 16. 2017	Initial issue

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## 1. GENERAL INFORMATION

### 1.1 Testing Laboratory

DT&C Co., Ltd.			
	Standard	Site number	Address
FCC	<input checked="" type="checkbox"/>	<b>165783</b>	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	<b>804488</b>	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	<b>596748</b>	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	<b>678747</b>	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
IC	<input type="checkbox"/>	<b>5740A-3</b>	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	<b>5740A-2</b>	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080

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Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

### 1.2 Tested Environment

Ambient Condition	
▪ Temperature	+20 ~ +25 °C
▪ Relative Humidity	41 % ~ 45 %

### 1.3 Measurement Uncertainty

Test items	Measurement uncertainty
Transmitter Output Power	0.70 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

## 1.4 Details of Applicant

Applicant : HYUNDAI MOBIS CO., LTD.  
Address : 203 Teheran-ro, Gangnam-gu, Seoul, Korea, 135-977  
Contact person : Seung Hoon Choe

## 1.5 Description of EUT

<b>FCC Equipment Class</b>	Unlicensed National Information Infrastructure (UNII)
<b>Product</b>	DIGITAL CAR AVN SYSTEM
<b>Model Name</b>	ADC30C6AN
<b>Add Model Name</b>	N/A
<b>Power Supply</b>	DC 14.4 V
<b>Hardware version</b>	1.0
<b>Software version</b>	1.0
<b>Frequency Range</b>	<b>U-NII 1(5150 ~ 5250 MHz)</b> <ul style="list-style-type: none"><li>▪ 802.11a/n(HT20)/ac(VHT20): 5180 ~ 5240 MHz</li><li>▪ 802.11n(HT40)/ac(VHT40): 5190 ~ 5230 MHz</li><li>▪ 802.11ac(VHT80): 5210 MHz</li></ul> <b>U-NII 2A(5250 ~ 5350 MHz)</b> <ul style="list-style-type: none"><li>▪ 802.11a/n(HT20)/ac(VHT20): 5260 ~ 5320 MHz</li><li>▪ 802.11n(HT40)/ac(VHT40): 5270 ~ 5310 MHz</li><li>▪ 802.11ac(VHT80): 5290 MHz</li></ul> <b>U-NII 2C(5470 ~ 5725 MHz)</b> <ul style="list-style-type: none"><li>▪ 802.11a/n(HT20)/ac(VHT20): 5500 ~ 5720 MHz</li><li>▪ 802.11n(HT40)/ac(VHT40): 5510 ~ 5710 MHz</li><li>▪ 802.11ac(VHT80): 5530 ~ 5690 MHz</li></ul> <b>U-NII 3(5725 ~ 5850MHz)</b> <ul style="list-style-type: none"><li>▪ 802.11a/n(HT20)/ac(VHT20): 5745 ~ 5825 MHz</li><li>▪ 802.11n(HT40)/ac(VHT40): 5755 ~ 5795 MHz</li><li>▪ 802.11ac(VHT80): 5775 MHz</li></ul>
<b>Modulation type</b>	OFDM
<b>Antenna Specification</b>	<b>Antenna type:</b> PCB antenna <b>Antenna gain</b> <ul style="list-style-type: none"><li>▪ U-NII-1: 2.89 dBi</li><li>▪ U-NII 2A: 2.51 dBi</li><li>▪ U-NII 2C: 2.51 dBi</li><li>▪ U-NII 3: 5.78 dBi</li></ul>

## 2. Information about test items

### 2.1 Test mode

5GHz Band	Mode	Data Rate
U-NII 1	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11ac(VHT40)	MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 2A	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11ac(VHT40)	MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 2C	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 3	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11ac(VHT40)	NSS1 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0

**Note 1:** The worst case data rate is determined as above test mode according to the power measurements and all test items were performed at the worst case data rate.

### 2.2 Tested Channel Information

5GHz Band	802.11a/n(HT20)		802.11n/ac(HT40/VHT40)		802.11ac(VHT80)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 1	36	5180	38	5190	-	-
	40	5200	-	-	42	5210
	48	5240	46	5230	-	-
U-NII 2A	52	5260	54	5270	-	-
	60	5300	-	-	58	5290
	64	5320	62	5310	-	-
U-NII 2C	100	5500	102	5510	106	5530
	120	5600	118	5590	122	5610
	144	5720	142	5710	138	5690
U-NII 3	149	5745	151	5755	-	-
	157	5785	-	-	155	5775
	165	5825	159	5795	-	-

## 2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

## 2.4 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing

→ None

### 3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
<b>I. Transmitter Mode (TX)</b>				
15.407(a)	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C
15.407(e)	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz (5725-5850)		C
15.407(a)	Maximum Conducted Output Power	5150 ~ 5250MHz : < 30 dBm or < 23.97 dBm 5250 ~ 5350MHz & 5470 ~ 5725MHz : 250mW or <11 + 10log <sub>10</sub> (B) dBm, whichever power is less. Note: Where, B is the 26dB BW. 5725 ~ 5850MHz : < 30 dBm		C <sup>Note 3</sup>
15.407(a)	Maximum Power Spectral Density	5150 ~ 5250MHz : 11dBm/MHz or 17dBm/MHz 5250 ~ 5350MHz & 5470 ~ 5725MHz: 11dBm/MHz 5725 ~ 5850MHz: 30dBm/500kHz		C <sup>Note 4</sup>
15.407(g)	Frequency Stability	N/A	Radiated	C
15.407(b)	Undesirable Emissions	5150 ~ 5725MHz: < -27 dBm/MHz EIRP 5725 ~ 5850 MHz: < -27 dBm/MHz or < 10 dBm/MHz or 15.6 dBm/MHz or < 27dBm/MHz EIRP		C <sup>Note 5</sup>
15.205 15.209	General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		C
15.407(h)	Dynamic Frequency Selection	FCC 15.407(h)	Conducted	C <sup>Note 6</sup>
15.207	AC Conducted Emissions	FCC 15.207	AC Line Conducted	NA <sup>Note 7</sup>
15.203	Antenna Requirements	FCC 15.203	-	C

Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable

Note 2: The test items were performed according to the KDB789033 D02 V01 and ANSI C63.10-2013.

Note 3: (i) For access point operating in the band 5.15-5.25 GHz: < 30 dBm

(ii) For mobile and portable client devices in the 5.15-5.25 GHz band: < 23.97 dBm

Note 4: (i) For access point operating in the band 5.15-5.25 GHz: < 17 dBm/MHz

(ii) For mobile and portable client devices in the 5.15-5.25 GHz band: < 11 dBm/MHz

Note 5: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Note 6: For DFS testing, please refer to DFS test report.

Note 7: This device is installed in a car. Therefore the power source is a battery of car.

## 4. TEST METHODOLOGY

Generally the tests were performed according to the KDB789033 D02 v01r03. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

### 4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### 4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart C.

### 4.3 General test procedures

#### Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB789033 D02. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.

The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

#### Radiated Emissions

Basically the radiated tests were performed with KDB789033 D02. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on KDB789033 D02.

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 1 or 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

#### Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, loop, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 4.4 Description of test modes

A test program is used to control the EUT for staying in continuous transmitting mode with maximum fixed duty cycle.

## 5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

## 6. ANTENNA REQUIREMENTS

### - According to FCC 47 CFR §15.203:

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 internal antenna is permanently attached. (Refer to Internal Photo file.)**

**Therefore this EUT complies with the requirement of §15.203**

## 7. TEST RESULT

### 7.1 Emission Bandwidth (26 dB Bandwidth)

#### Test Requirements

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

#### Test Configuration

Refer to the APPENDIX I.

#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02**.

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW.
2. Set the video bandwidth (**VBW**) > **RBW**.
3. Detector = **Peak**.
4. Trace mode = **Max hold**.

Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

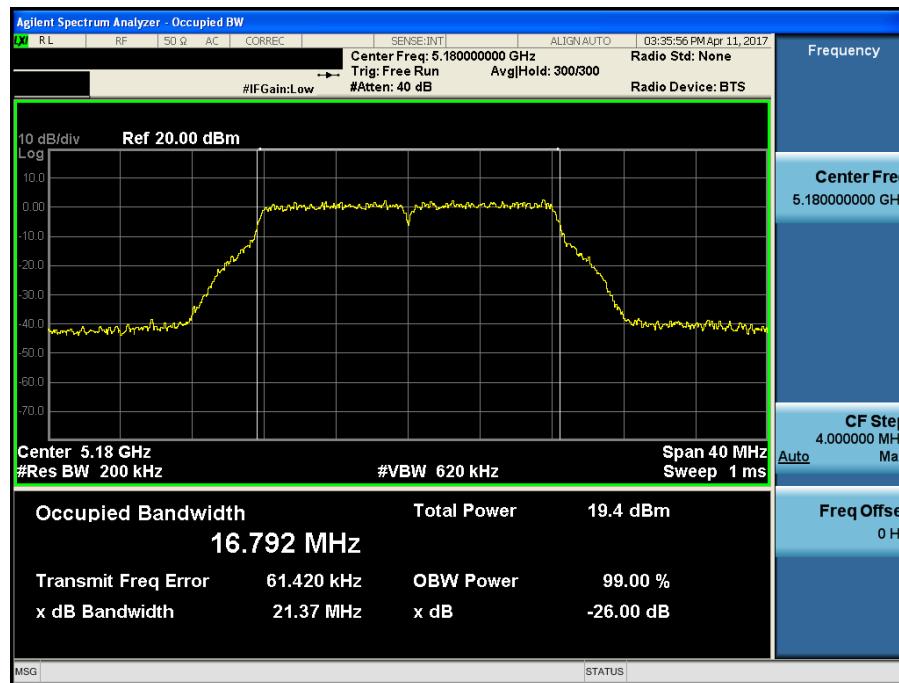
**TEST RESULTS: Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 1	36	5180	21.370
		40	5200	21.510
		48	5240	21.520
	U-NII 2A	52	5260	21.560
		60	5300	21.670
		64	5320	21.380
	U-NII 2C	100	5500	21.440
		120	5600	21.690
		144	5720	21.340
802.11n (HT20)	U-NII 1	36	5180	21.610
		40	5200	21.700
		48	5240	21.530
	U-NII 2A	52	5260	21.690
		60	5300	21.730
		64	5320	21.570
	U-NII 2C	100	5500	21.660
		120	5600	21.800
		144	5720	21.690
802.11ac (VHT40)	U-NII 1	38	5190	40.130
		46	5230	40.120
	U-NII 2A	54	5270	39.950
		62	5310	40.150
	U-NII 2C	102	5510	40.110
		118	5590	40.030
		142	5710	39.910
802.11ac (VHT80)	U-NII 1	42	5210	81.740
		-	-	-
	U-NII 2A	58	5290	81.800
		-	-	-
	U-NII 2C	106	5530	81.960
		122	5610	82.340
		138	5690	81.690

## Result Plots

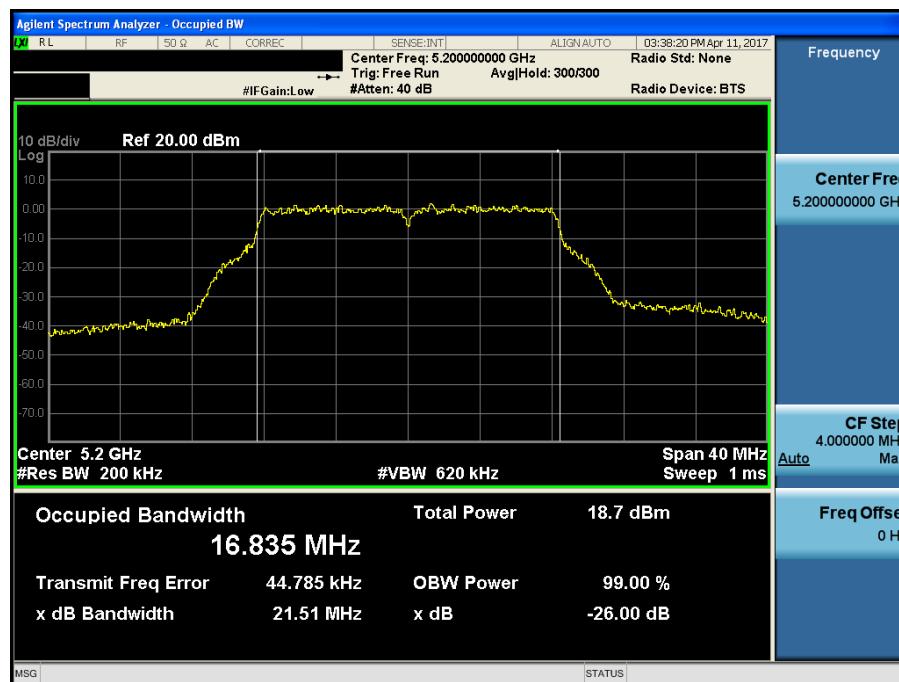
### 26 dB Bandwidth

Test Mode: 802.11a & Ch.36



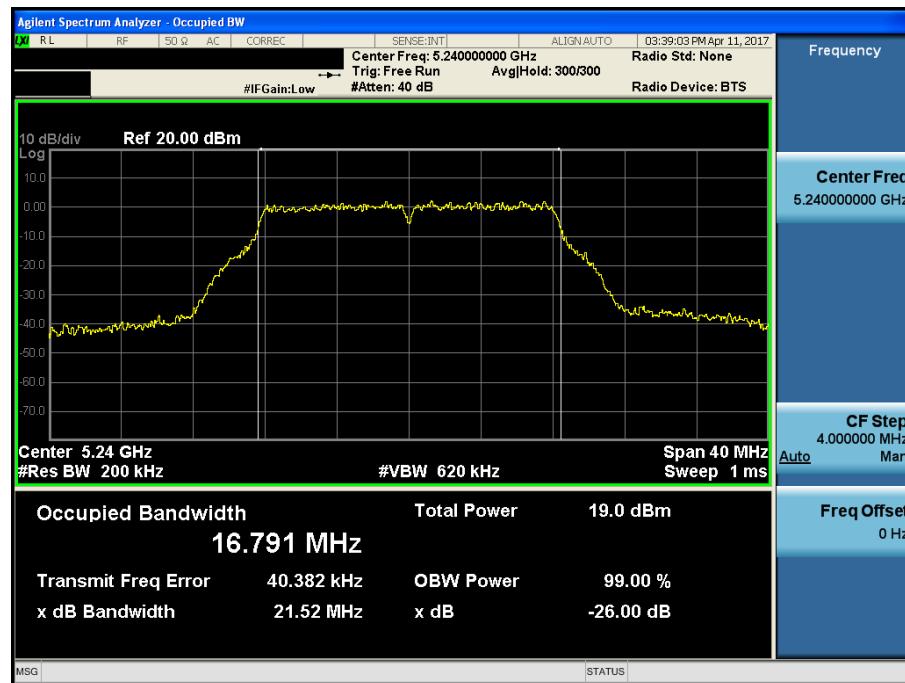
### 26 dB Bandwidth

Test Mode: 802.11a & Ch.40



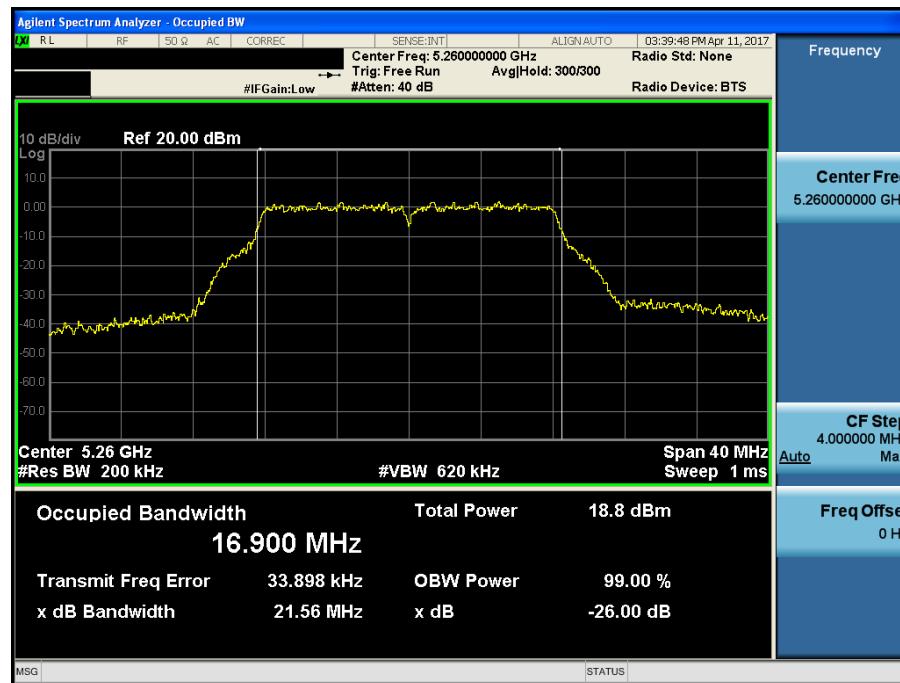
## 26 dB Bandwidth

Test Mode: 802.11a & Ch.48



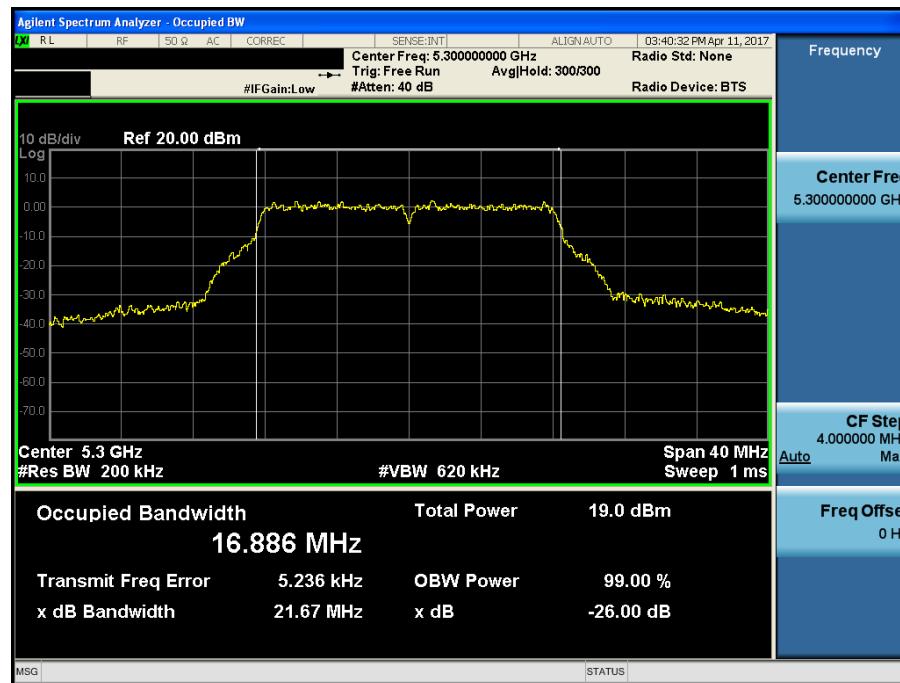
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.52



## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.60



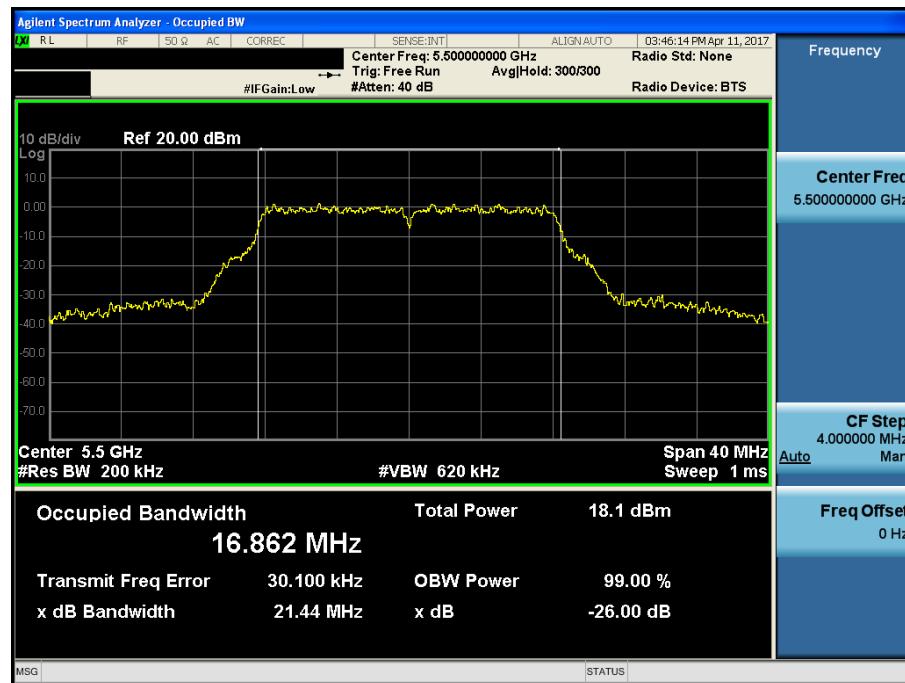
## 26 dB Bandwidth

Test Mode: 802.11a & Ch.64



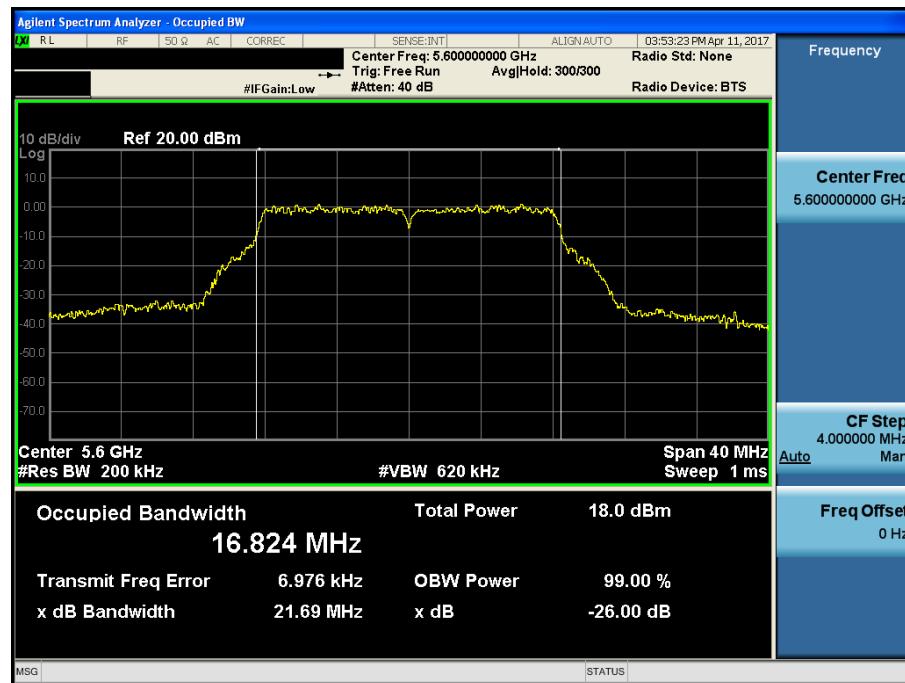
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.100



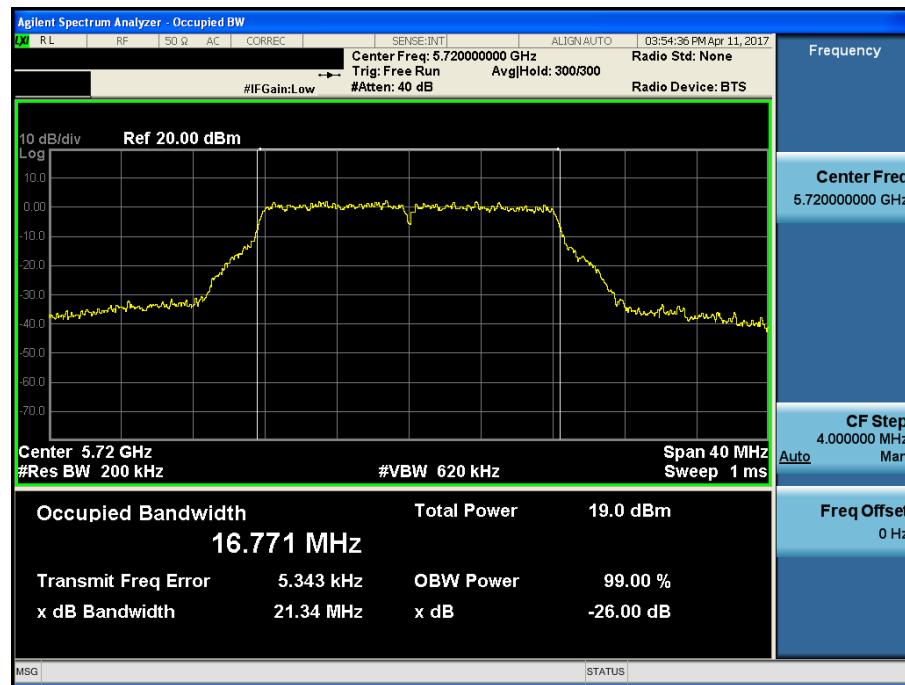
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.120



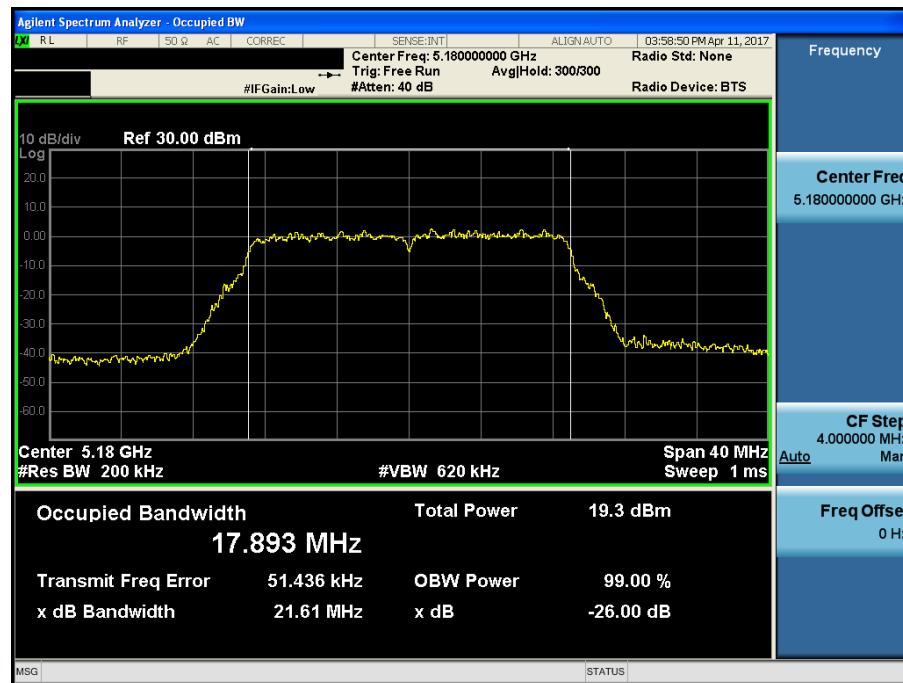
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.144



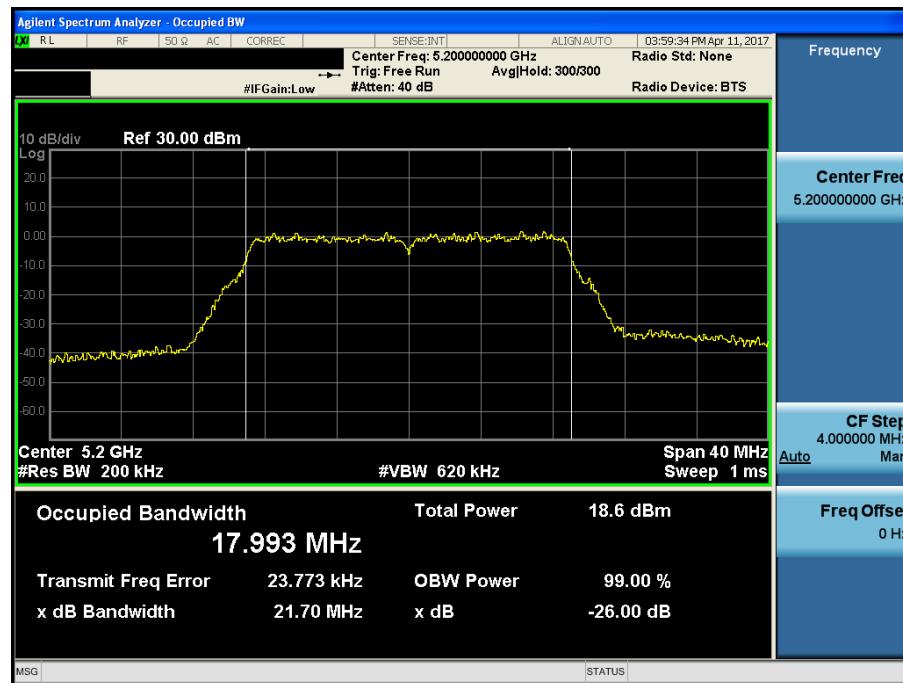
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.36



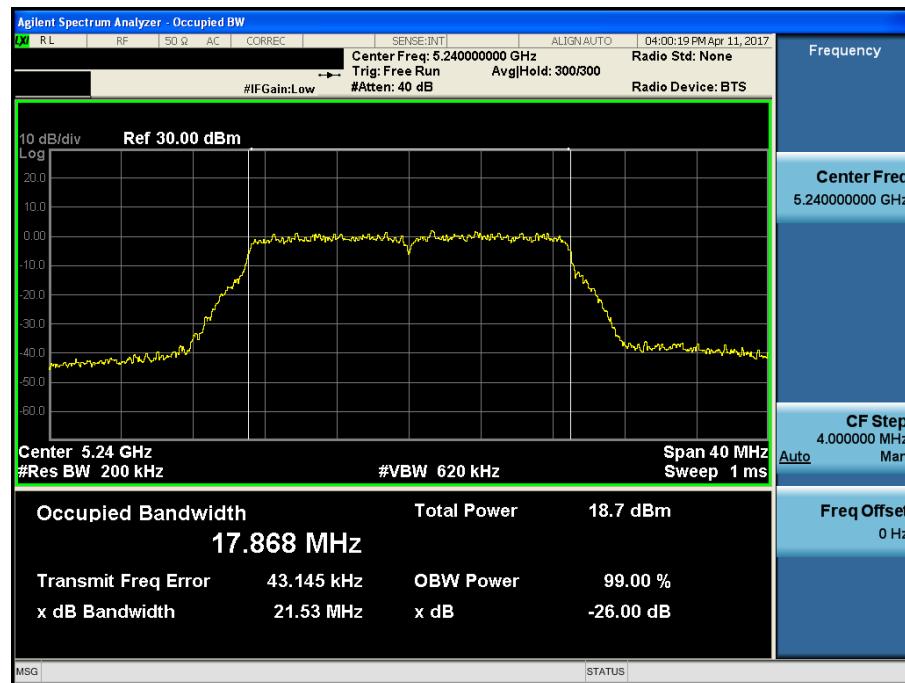
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.40



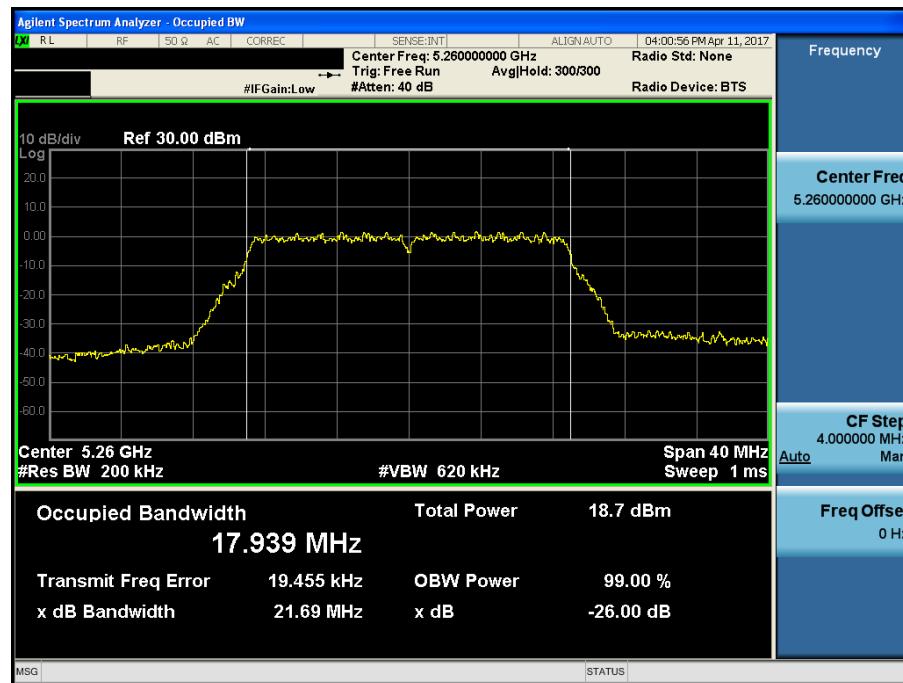
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.48



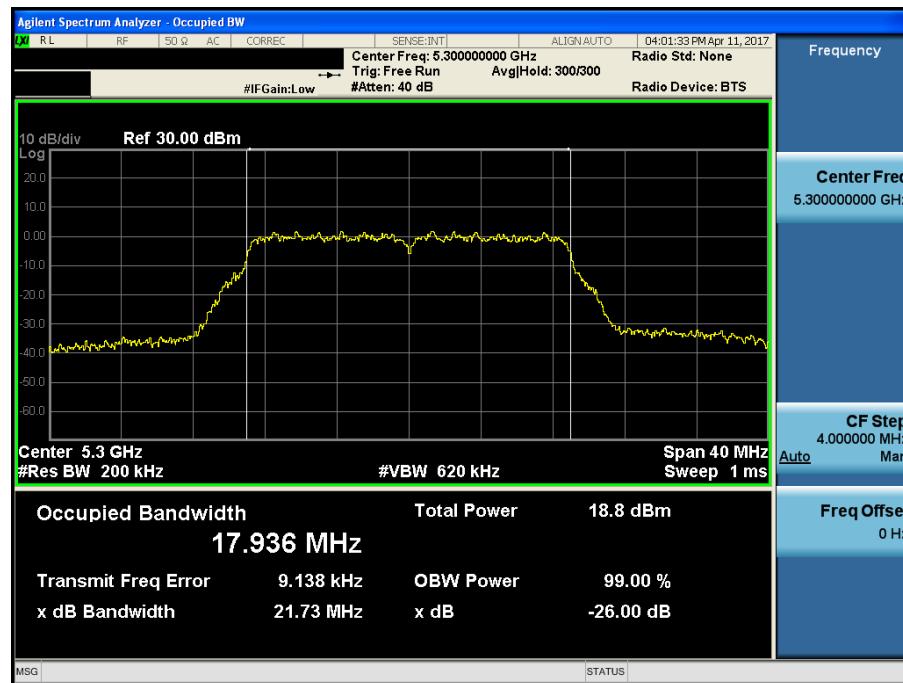
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.52



## 26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.60



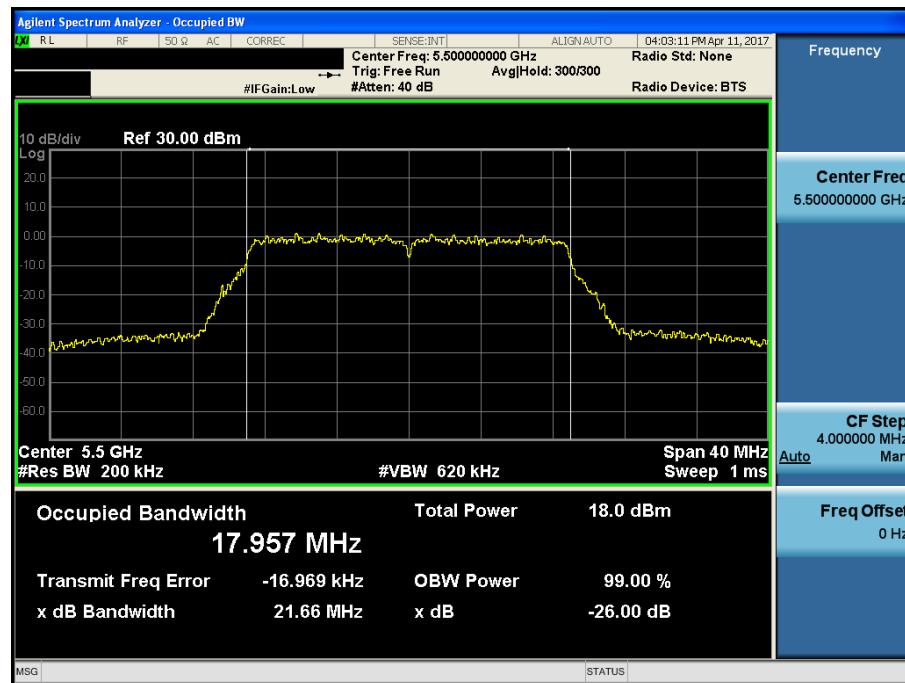
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.64



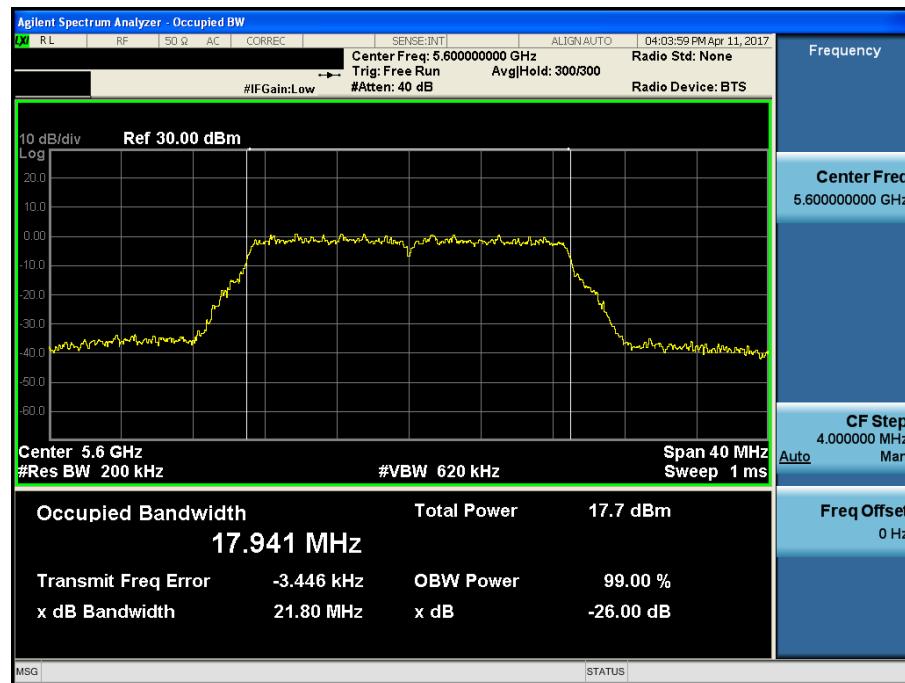
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.100



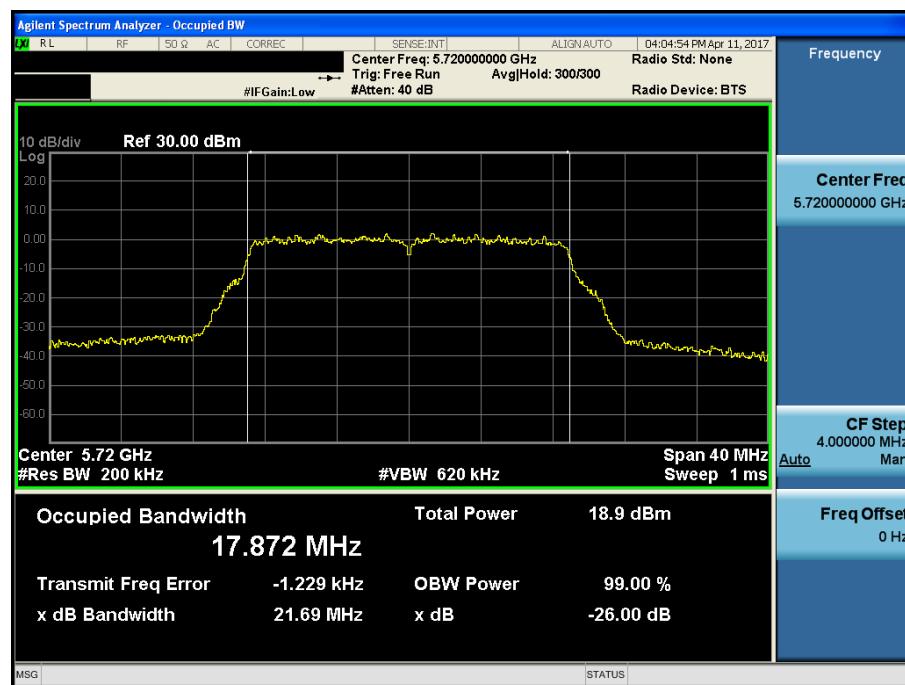
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.120



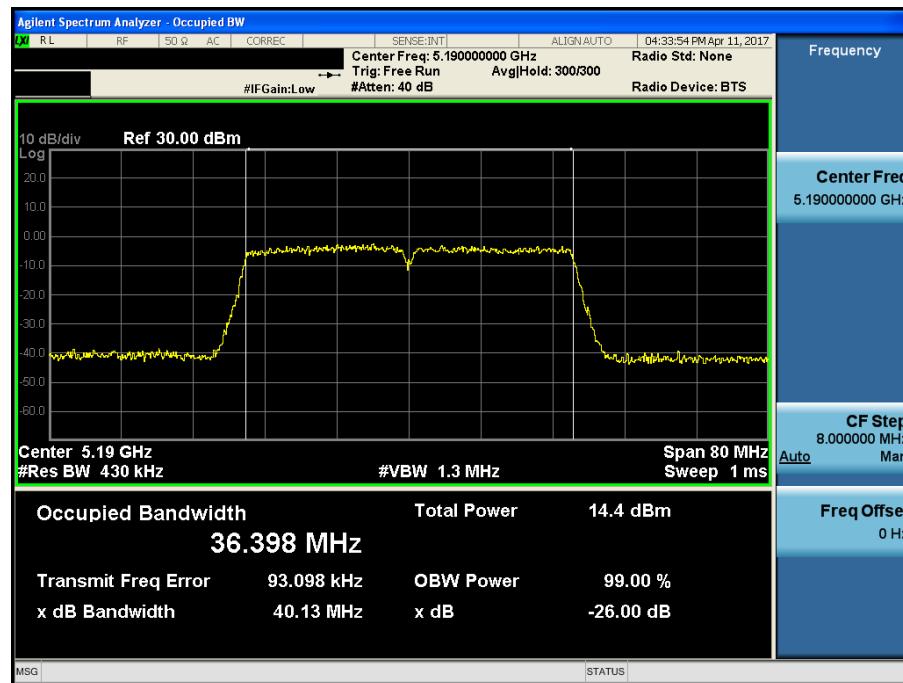
## 26 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.144



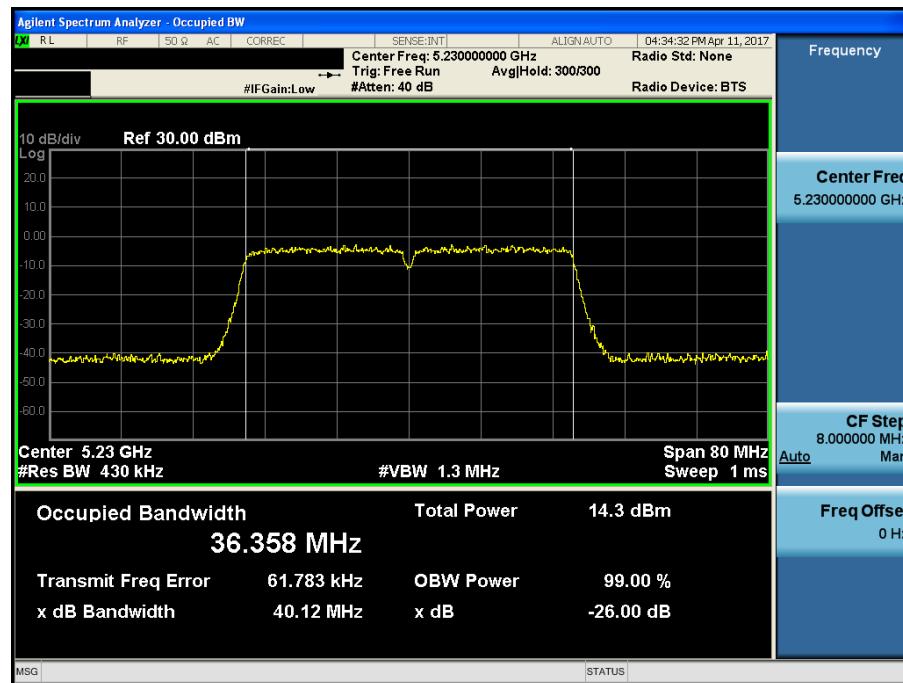
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.38



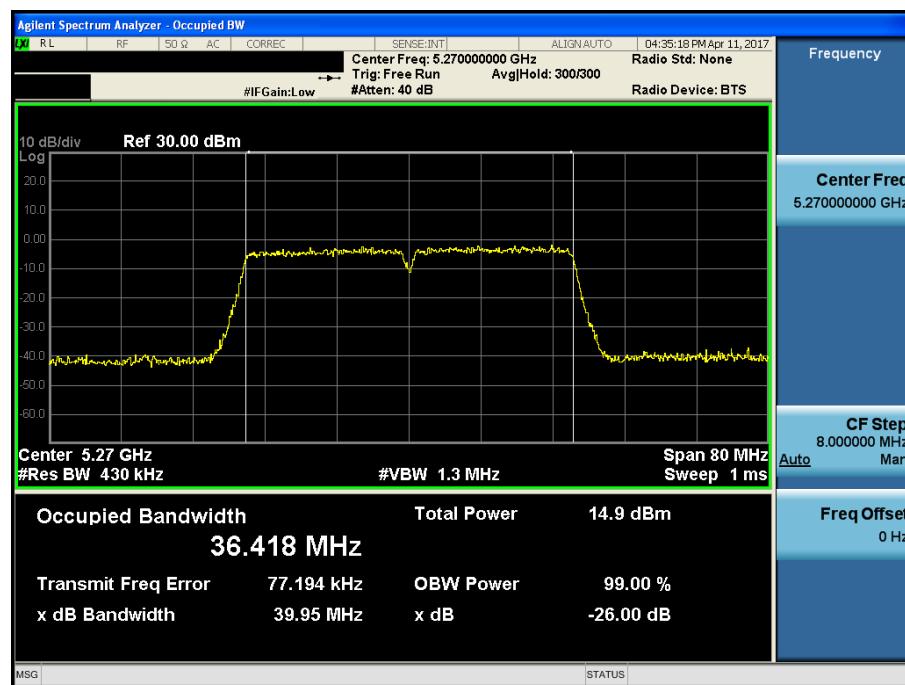
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.46



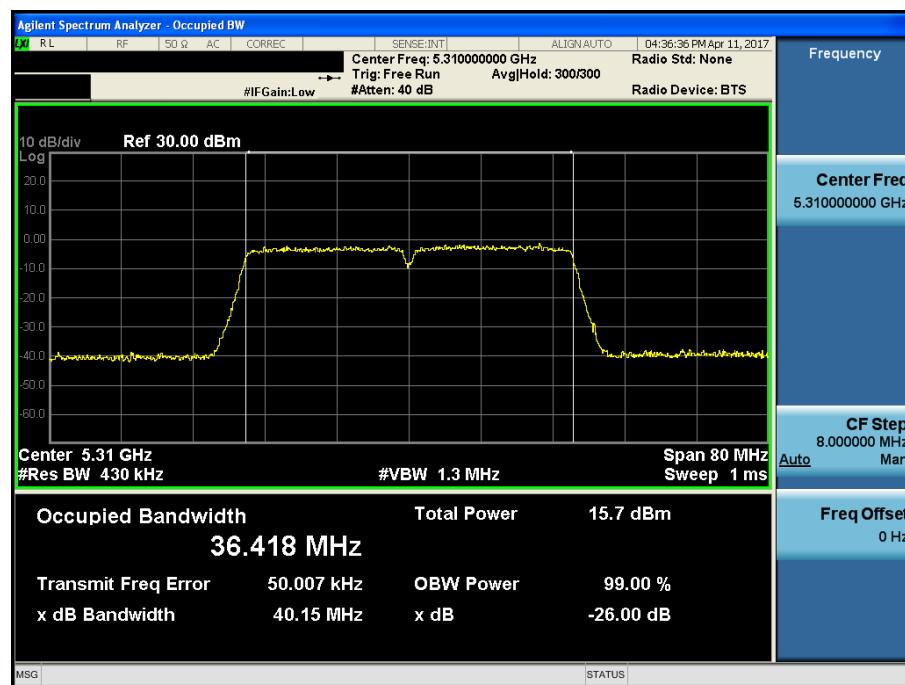
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.54



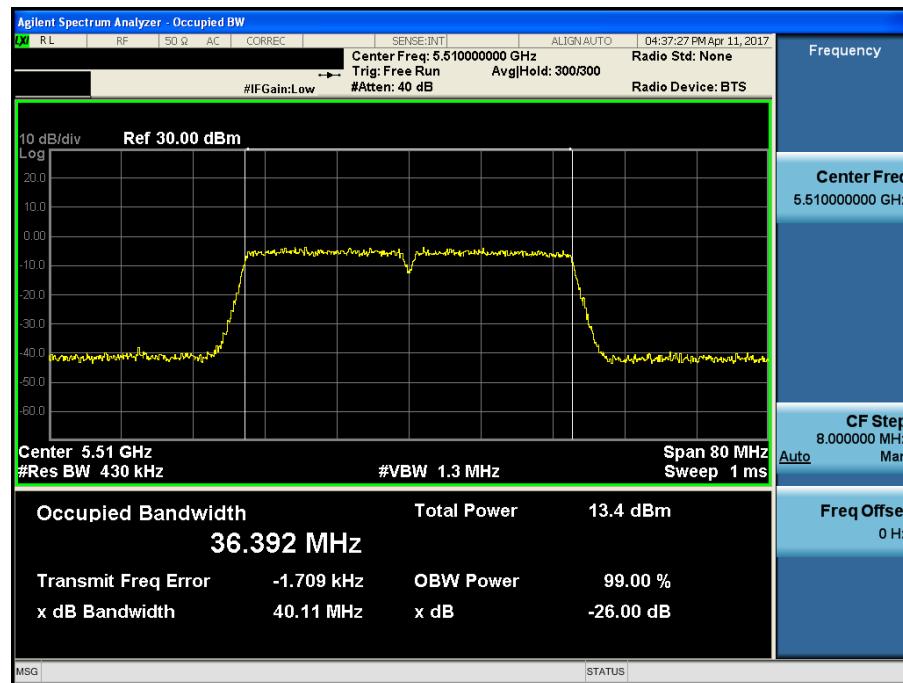
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.62



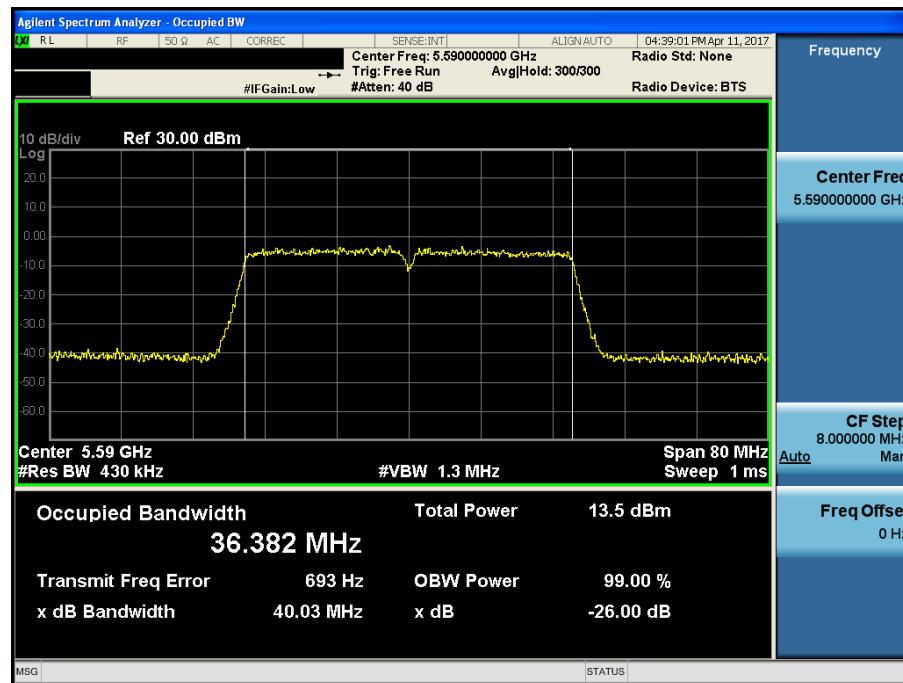
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.102



## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.118



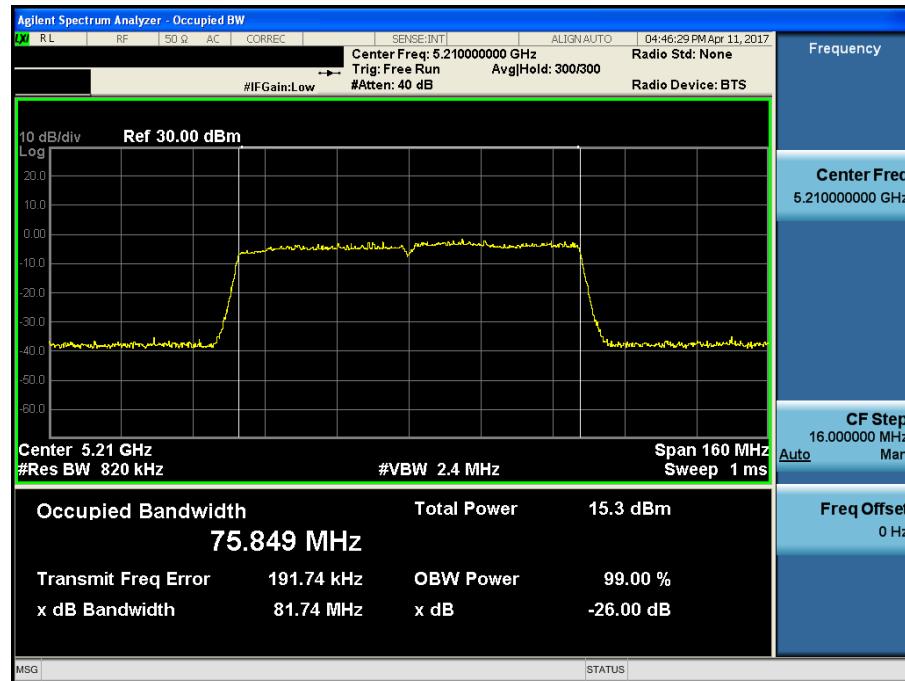
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.142



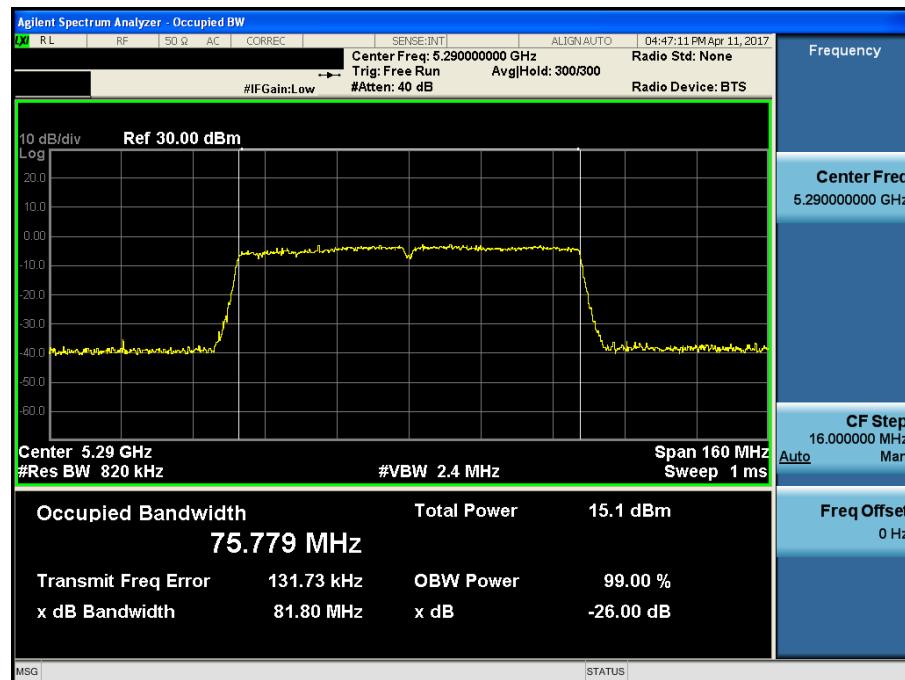
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT80) & Ch.42



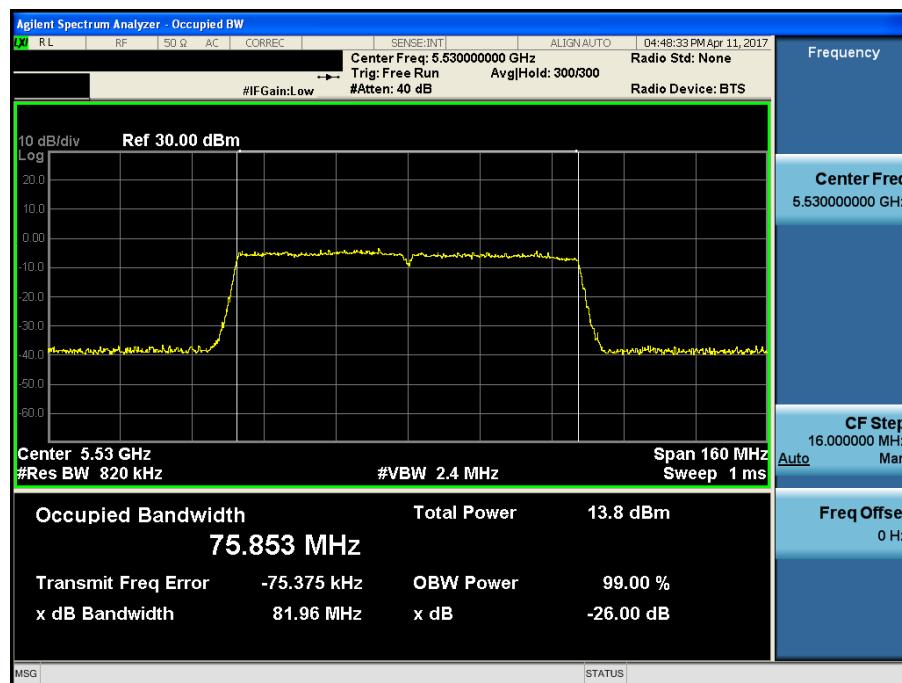
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT80) & Ch.58



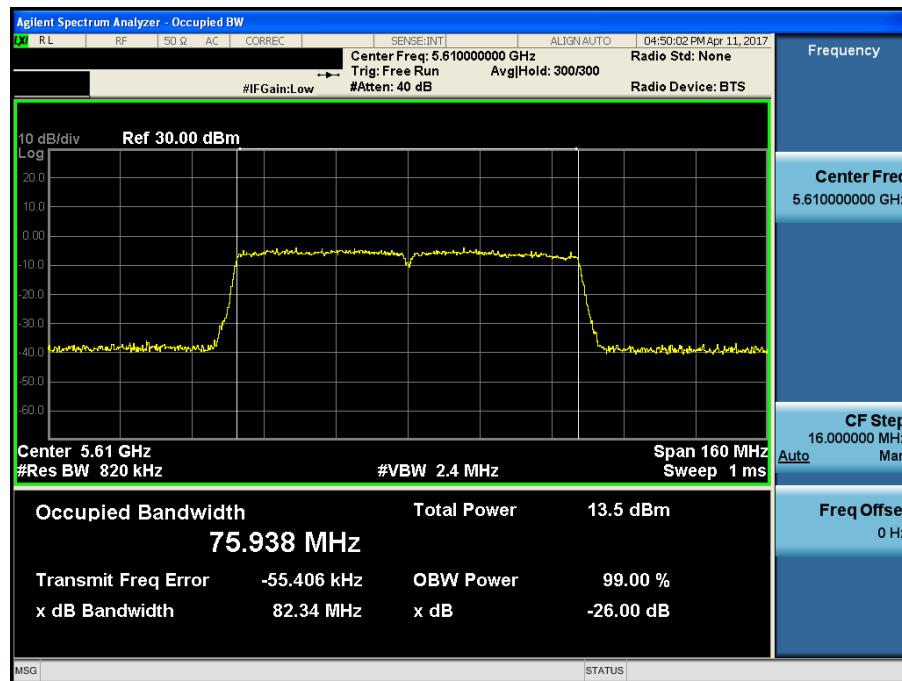
## 26 dB Bandwidth

Test Mode: 802.11ac(VHT80) &amp; Ch.106



## 26 dB Bandwidth

Test Mode: 802.11ac(VHT80) &amp; Ch.122



## 26 dB Bandwidth

Test Mode: 802.11ac(VHT80) &amp; Ch.138



## 7.2 Minimum Emission Bandwidth (6 dB Bandwidth)

### Test Requirements

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### Test Configuration

Refer to the APPENDIX I.

### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02**.

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth  $\geq 3 \times \text{RBW}$ .
3. Detector = **Peak**.
4. Trace mode = **max hold**.

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.

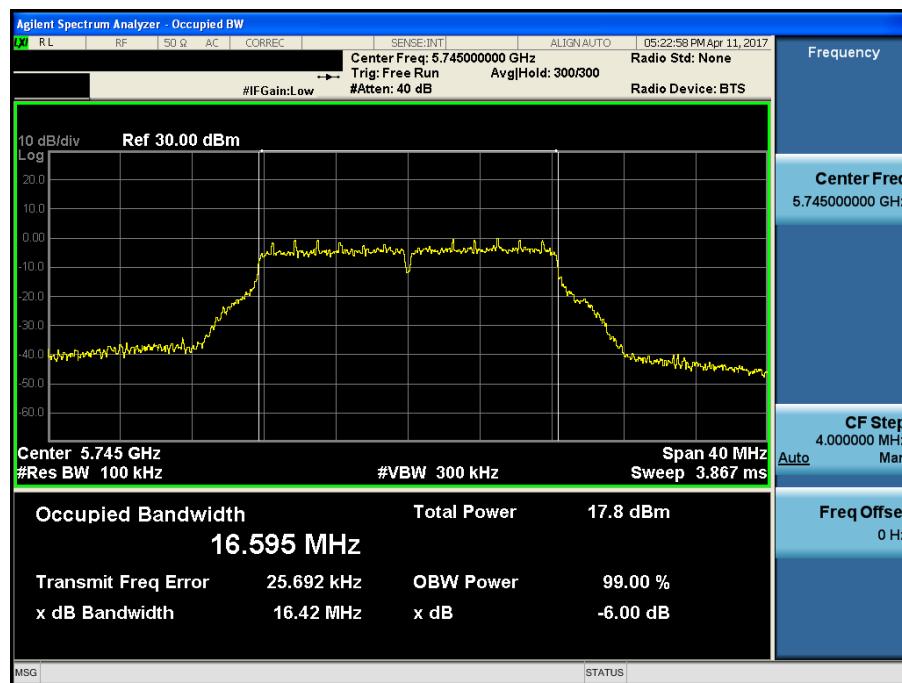
### TEST RESULTS: **Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 3	149	5745	16.420
		157	5785	16.390
		165	5825	16.380
802.11n (HT20)	U-NII 3	149	5745	17.600
		157	5785	17.610
		165	5825	17.630
802.11ac (VHT40)	U-NII 3	151	5755	36.360
		159	5795	36.390
802.11ac (VHT80)	U-NII 3	155	5775	75.560

## RESULT PLOTS

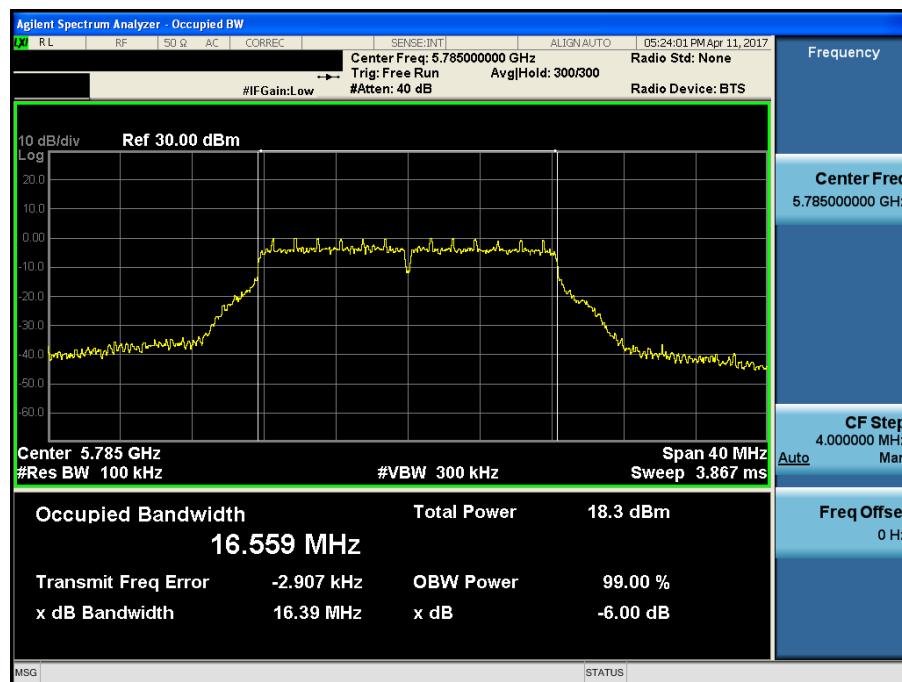
### 6 dB Bandwidth

Test Mode: 802.11a & Ch.149



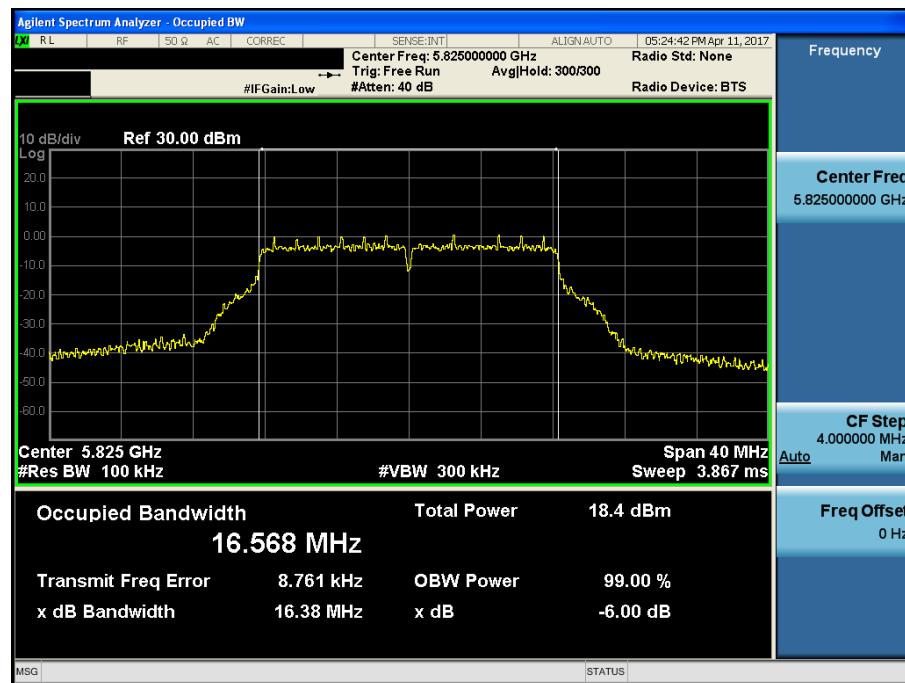
### 6 dB Bandwidth

Test Mode: 802.11a & Ch.157



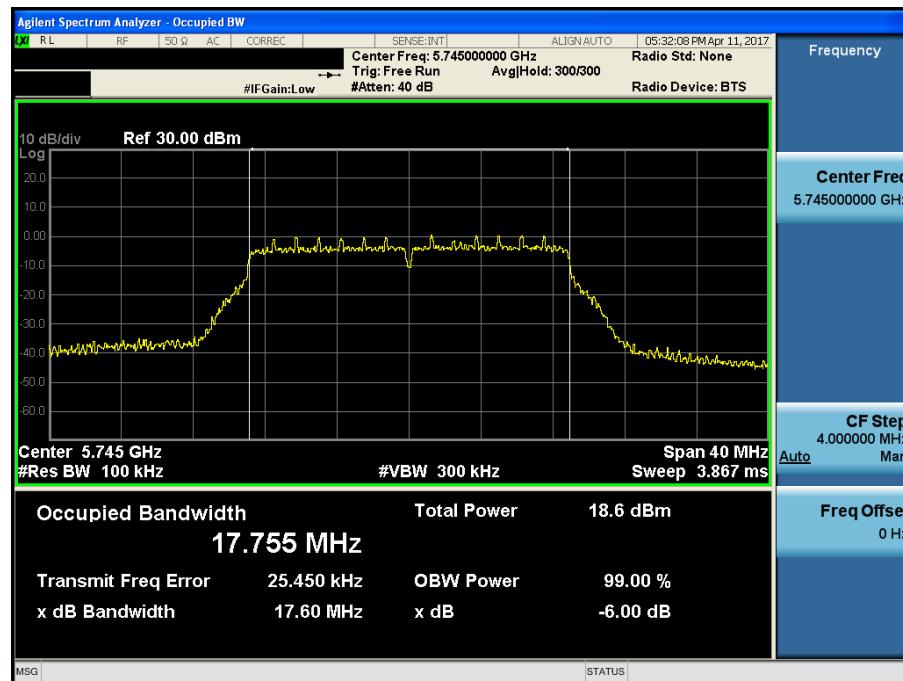
## 6 dB Bandwidth

Test Mode: 802.11a & Ch.165



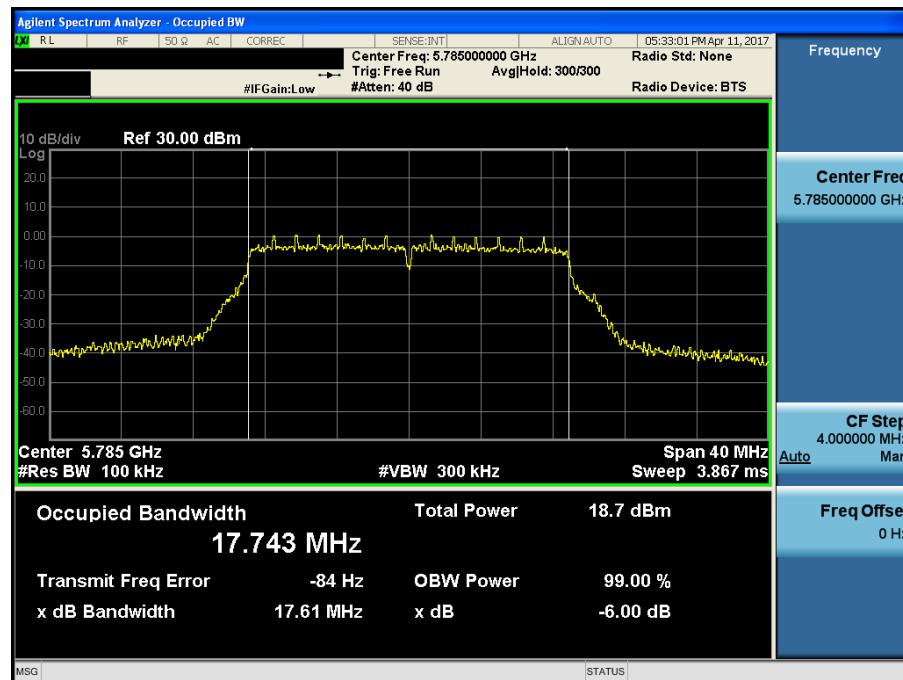
## 6 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.149



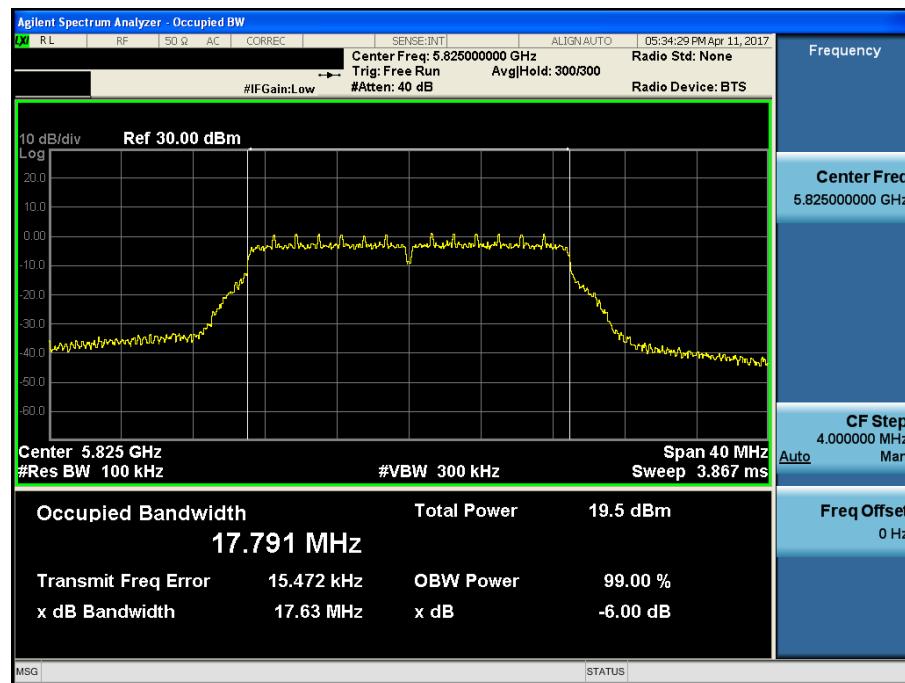
## 6 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.157



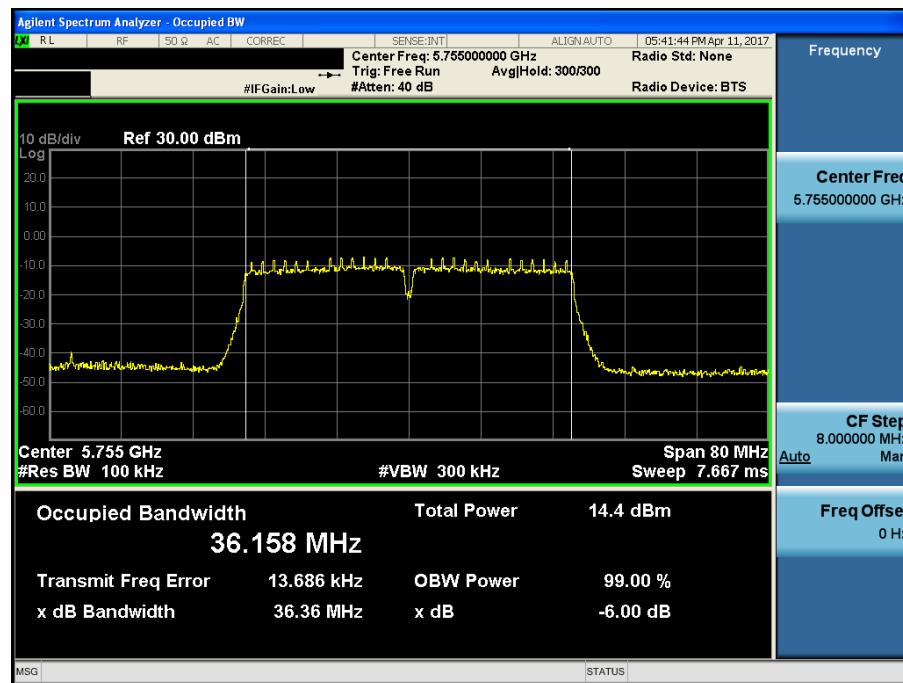
## 6 dB Bandwidth

Test Mode: 802.11n(HT20) &amp; Ch.165



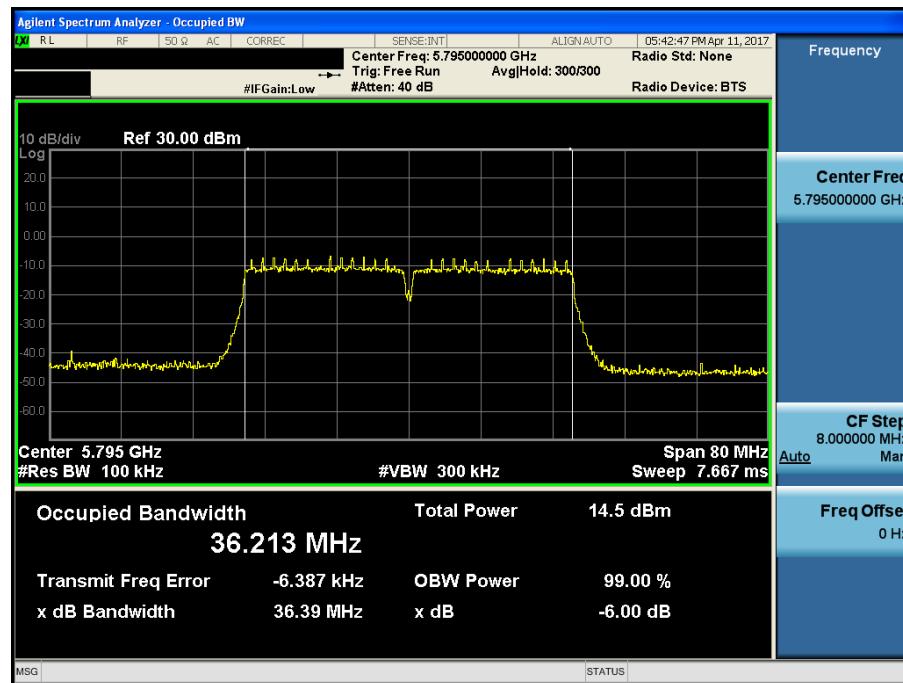
## 6 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.151



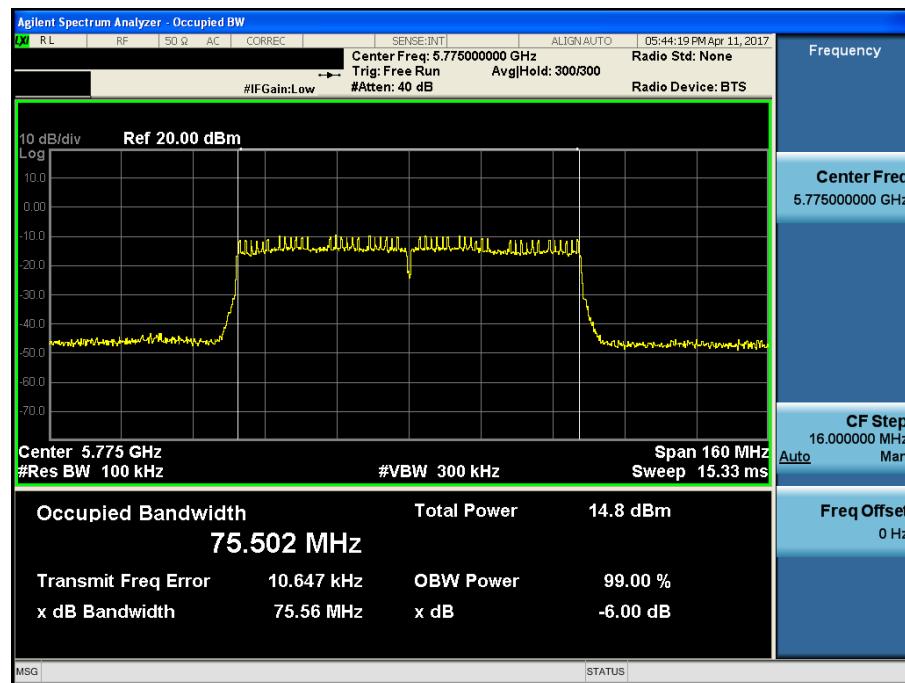
## 6 dB Bandwidth

Test Mode: 802.11ac(VHT40) &amp; Ch.159



## 6 dB Bandwidth

Test Mode: 802.11ac(VHT80) & Ch.155



## 7.3 Maximum Conducted Output Power

### Test Requirements

#### Part. 15.407(a)

##### (1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor 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. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

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

(iii) For fixed point-to-point access points 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. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) 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 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725 - 5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

## - Output power Limit Calculation(FCC)

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 1	802.11a	250	23.97	2.890	23.97
	802.11n(HT20)				
	802.11ac(VHT40)				
	802.11ac(VHT80)				

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2A	802.11a	250	23.97	2.510	23.97
		21.38	24.30		
	802.11n(HT20)	250	23.97		
		21.57	24.33		
	802.11ac(VHT40)	250	23.97		
		39.95	27.01		
	802.11ac(VHT80)	250	23.97		
		81.80	30.12		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2C	802.11a	250	23.97	2.510	23.97
		21.34	24.29		
	802.11n(HT20)	250	23.97		
		21.66	24.35		
	802.11ac(VHT40)	250	23.97		
		39.91	27.01		
	802.11ac(VHT80)	250	23.97		
		81.69	30.12		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 3	802.11a	1000	30.00	5.780	30.00
	802.11n(HT20)				
	802.11ac(VHT40)				
	802.11ac(VHT80)				

## □ Test Configuration



Method PM-G

## □ Test Procedure

### Method PM-G of KDB789033 D02

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

## □ Test Results: Comply

Mode	Bands	Channel	Frequency [MHz]	Test Result [dBm]
802.11a	U-NII 1	36	5180	13.868
		40	5200	13.782
		48	5240	13.556
	U-NII 2A	52	5260	13.812
		60	5300	13.342
		64	5320	13.631
	U-NII 2C	100	5500	12.464
		120	5600	12.485
		144	5720	13.379
	U-NII 3	149	5745	12.756
		157	5785	12.651
		165	5825	13.231
802.11n(HT20)	U-NII 1	36	5180	14.058
		40	5200	13.922
		48	5240	13.778
	U-NII 2A	52	5260	14.161
		60	5300	13.422
		64	5320	13.658
	U-NII 2C	100	5500	12.750
		120	5600	12.561
		144	5720	13.608
	U-NII 3	149	5745	12.956
		157	5785	12.934
		165	5825	13.648
802.11n(HT40)	U-NII 1	38	5190	9.548
		46	5230	9.411
	U-NII 2A	54	5270	10.208
		62	5310	10.181
	U-NII 2C	102	5510	8.312
		118	5590	8.573
		142	5710	9.058
	U-NII 3	151	5755	8.482
		159	5795	8.599

**Test Results: Comply**

Mode	Bands	Channel	Frequency [MHz]	Test Result [dBm]
802.11ac(VHT20)	U-NII 1	36	5180	14.078
		40	5200	13.856
		48	5240	13.686
	U-NII 2A	52	5260	14.147
		60	5300	13.529
		64	5320	13.585
	U-NII 2C	100	5500	12.730
		120	5600	12.689
		144	5720	13.559
	U-NII 3	149	5745	12.892
		157	5785	13.054
		165	5825	13.387
802.11ac(VHT40)	U-NII 1	38	5190	9.347
		46	5230	9.491
	U-NII 2A	54	5270	10.305
		62	5310	10.248
	U-NII 2C	102	5510	8.173
		118	5590	8.193
		142	5710	9.051
	U-NII 3	151	5755	8.616
		159	5795	8.776
802.11ac(VHT80)	U-NII 1	42	5210	9.360
		-	-	-
	U-NII 2A	58	5290	9.862
		-	-	-
	U-NII 2C	106	5530	8.055
		122	5610	8.152
		138	5690	8.677
	U-NII 3	155	5755	8.653
		-	-	-

## 7.4 Maximum Power Spectral Density

### Test requirements

#### **(1) For the band 5.15-5.25 GHz.**

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1MHz band. <sup>note1</sup>

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1MHz band. <sup>note1</sup>

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

**(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1MHz band.** <sup>note1</sup>

#### **(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band.** <sup>note1</sup>

#### **(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.** <sup>note1,note2</sup>

**Note1:** If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**Note2:** fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

### **- Peak Power Spectral Density Limit Calculation**

Band	Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 1	11	2.890	11
U-NII 2A	11	2.510	11
U-NII 2C	11	2.510	11
U-NII 3	30	5.780	30

**■ Test configuration**

Refer to the APPENDIX I.

**■ Test procedure**

Maximum Power Spectral Density is measured using Measurement Procedure of **KDB789033 D02 V01**

- 1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
- 2) Use the peak search function on the instrument to find the peak of the spectrum and record its value.
- 3) Make the following adjustments to the peak value of the spectrum, if applicable:
  - a) **If Method SA-2 or SA-2 Alternative was used, add  $10 \log(1/x)$ , where x is the duty cycle, to the peak of the spectrum.**
  - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
- 4) The result is the Maximum PSD over 1 MHz reference bandwidth.
- 5) For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
  - a) Set RBW  $\geq 1/T$ , where T is defined in section II.B.1.a). (Refer to Appendix II)
  - b) Set VBW  $\geq 3$  RBW.
  - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500\text{kHz}/\text{RBW})$  to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
  - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10\log(1\text{MHz}/\text{RBW})$  to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
  - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

**Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHz is available on nearly all spectrum analyzers.**

## ■ Test result: Comply

Mode	Channel	Frequency [MHz]	Reading [dBm]	T.F <sup>Note 1</sup> [dB]	Test Result [dBm]
802.11a	36	5180	-7.780	10.300	2.520
	40	5200	-8.750		1.550
	48	5240	-8.240		2.060
	52	5260	-8.300		2.000
	60	5300	-8.600		1.700
	64	5320	-8.660		1.640
	100	5500	-9.340		0.960
	120	5600	-9.630		0.670
	144	5720	-7.890		2.410
	149	5745	-9.130		-1.840
	157	5785	-8.980		-1.690
	165	5825	-8.550		-1.260
802.11n(HT20)	36	5180	-8.380	10.320	1.940
	40	5200	-8.840		1.480
	48	5240	-8.840		1.480
	52	5260	-8.720		1.600
	60	5300	-8.780		1.540
	64	5320	-8.630		1.690
	100	5500	-9.600		0.720
	120	5600	-9.860		0.460
	144	5720	-8.850		1.470
	149	5745	-9.730		-2.420
	157	5785	-9.640		-2.330
	165	5825	-9.090		-1.780
802.11ac(VHT40)	38	5190	-15.900	10.620	-5.280
	46	5230	-15.760		-5.140
	54	5270	-14.890		-4.270
	62	5310	-15.340		-4.720
	102	5510	-16.330		-5.710
	118	5590	-15.990		-5.370
	142	5710	-15.830		-5.210
	151	5755	-16.560		-8.950
	159	5795	-16.780		-9.170
	42	5210	-18.500		-7.330
802.11ac(VHT80)	-	-	-	11.170	-
	58	5290	-18.800		-7.630
	-	-	-		-
	106	5530	-19.070		-7.900
	122	5610	-19.890		-8.720
	138	5690	-19.930		-8.760
	155	5775	-19.990		-11.830
	-	-	-		-

Note 1: "U-NII 1, 2A, 2C [T.F] =  $10 \cdot \log(1\text{MHz}/100\text{kHz}) + \text{DCCF}$ ""U-NII 3 [T.F] =  $10 \cdot \log(500\text{kHz}/100\text{kHz}) + \text{DCCF}$ "

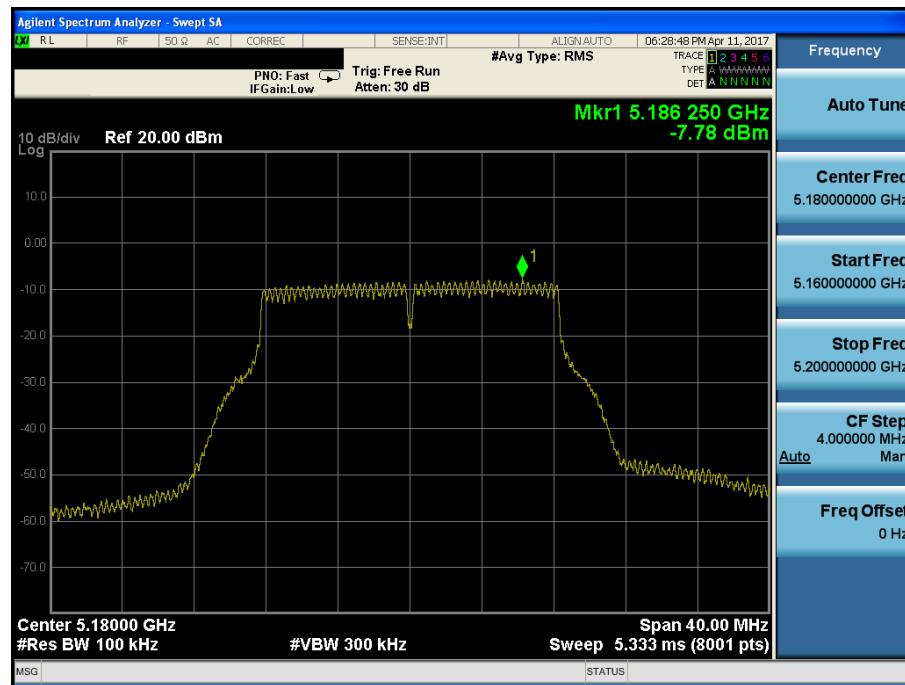
For DCCF(Duty Cycle Correction Factor) please refer to appendix II.

Note 2: Test Result = Measurement Data + T.F

## □ RESULT PLOTS

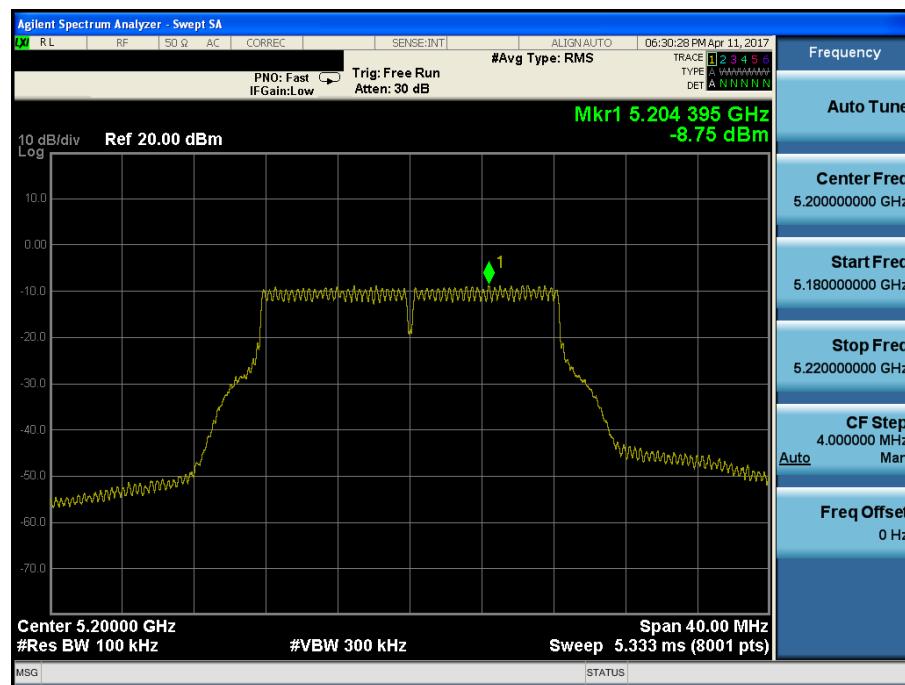
### Maximum Power Spectral Density

Test Mode: 802.11a & Ch.36



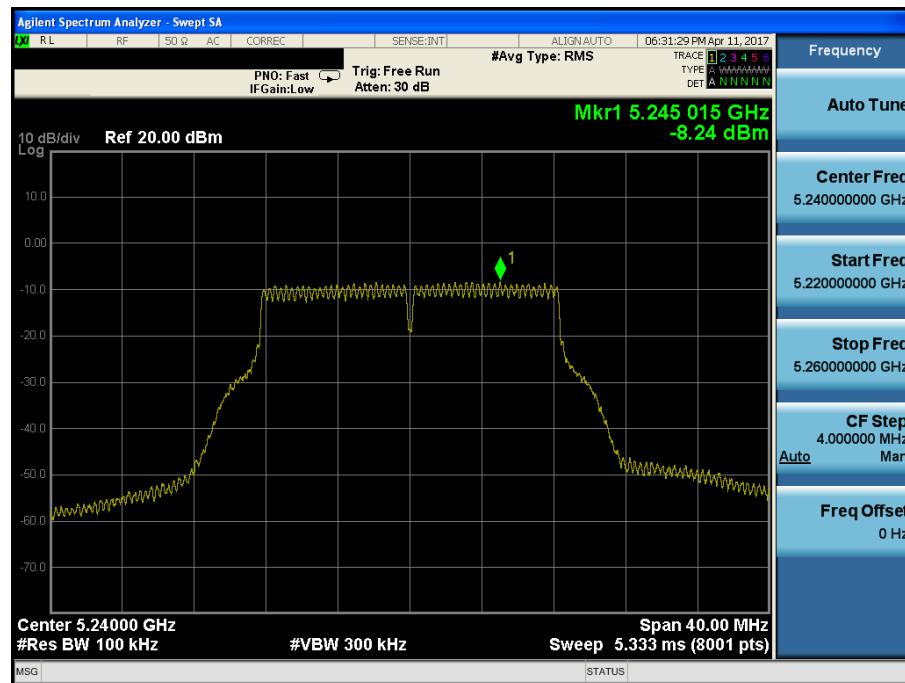
### Maximum Power Spectral Density

Test Mode: 802.11a & Ch.40



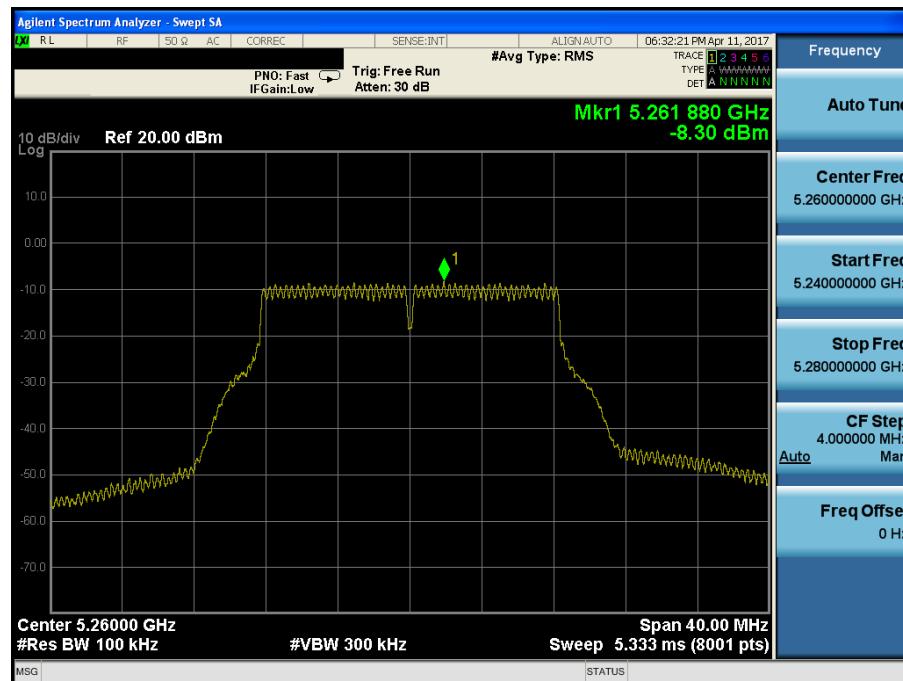
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.48



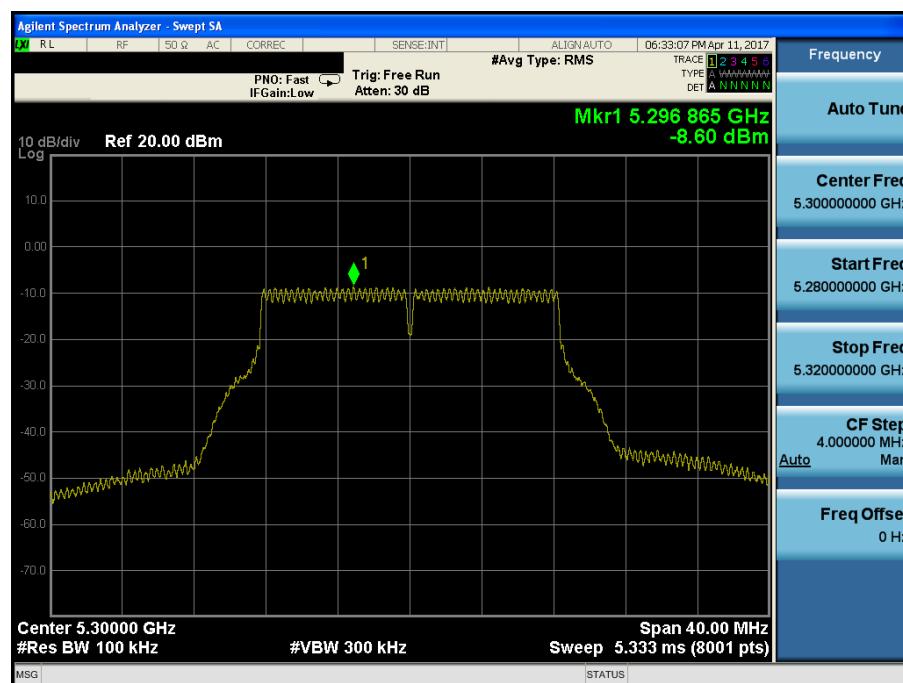
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.52



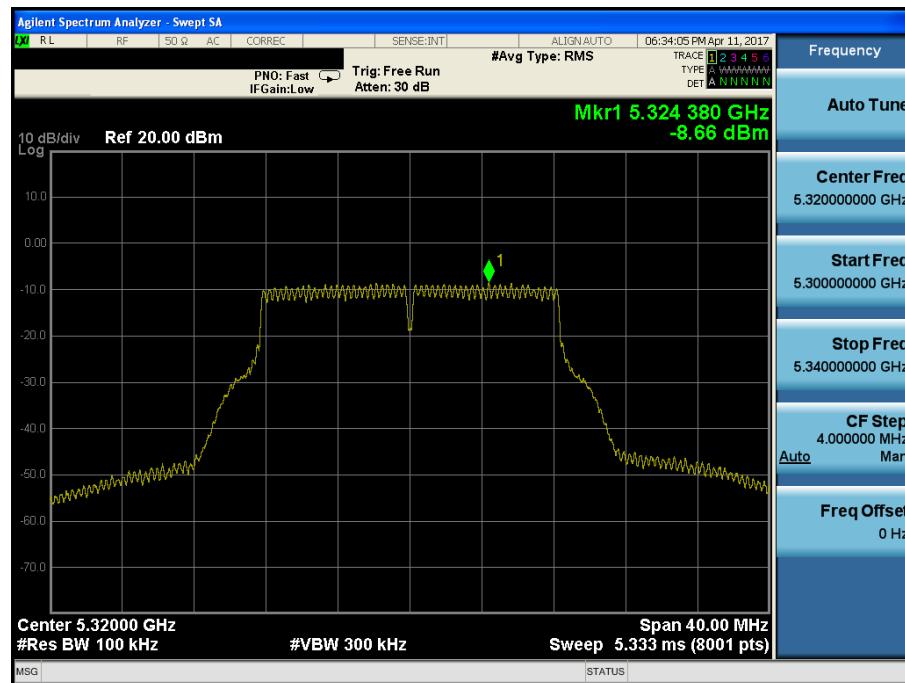
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.60



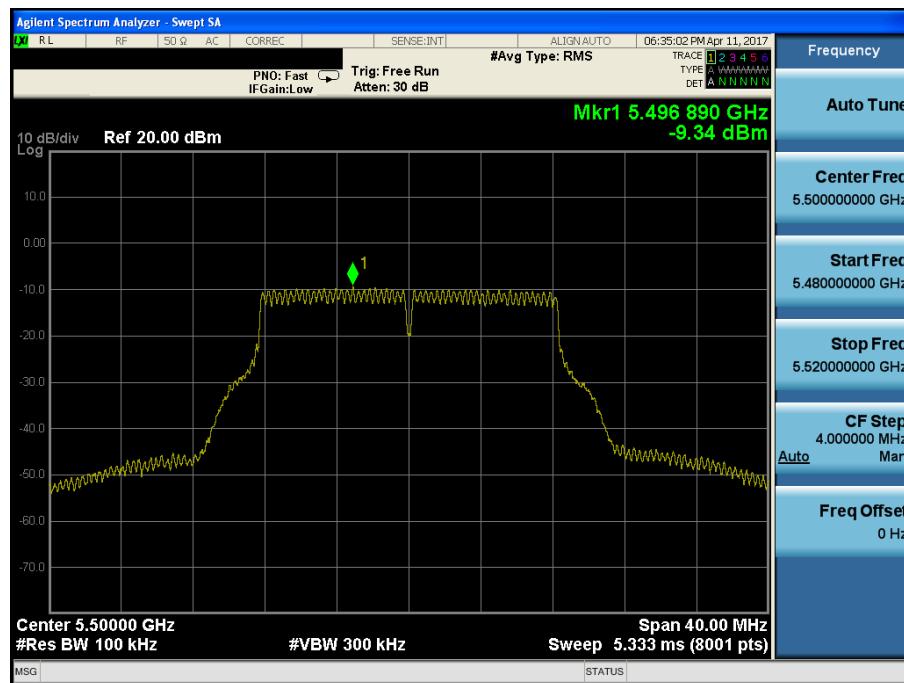
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.64



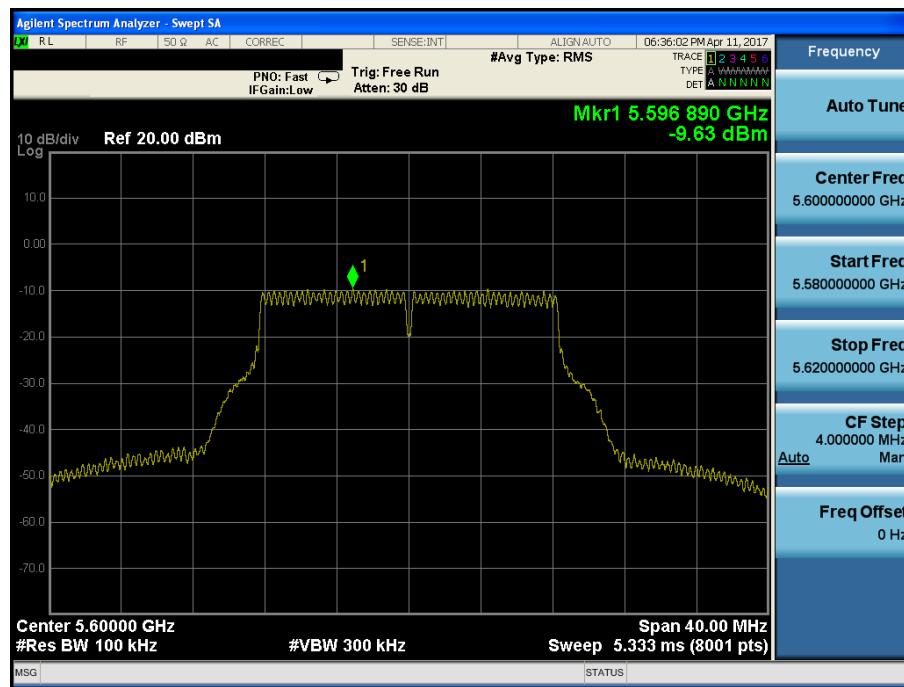
### Maximum Power Spectral Density

Test Mode: 802.11a & Ch.100



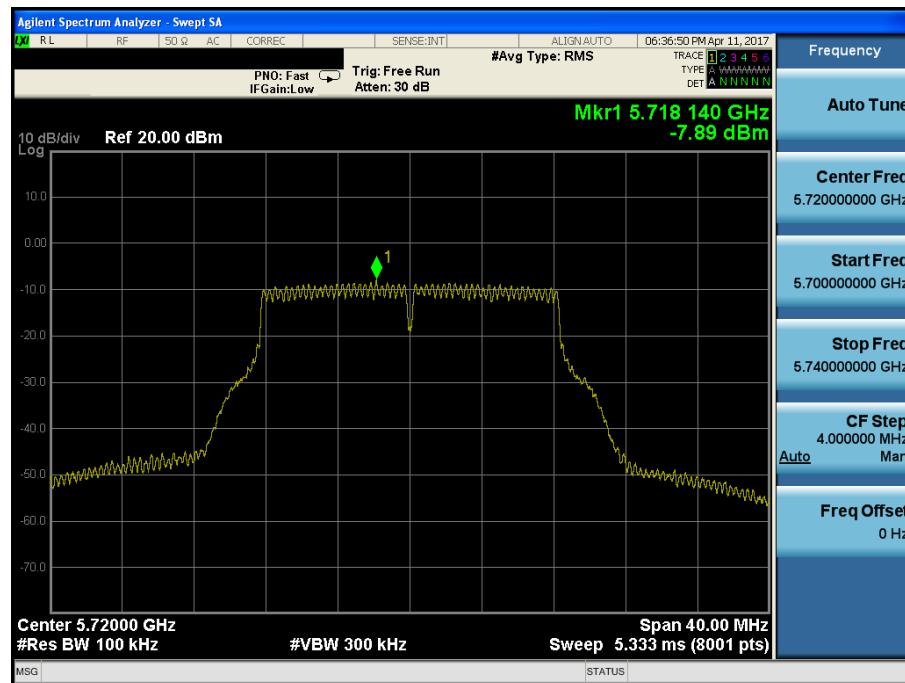
### Maximum Power Spectral Density

Test Mode: 802.11a & Ch.120



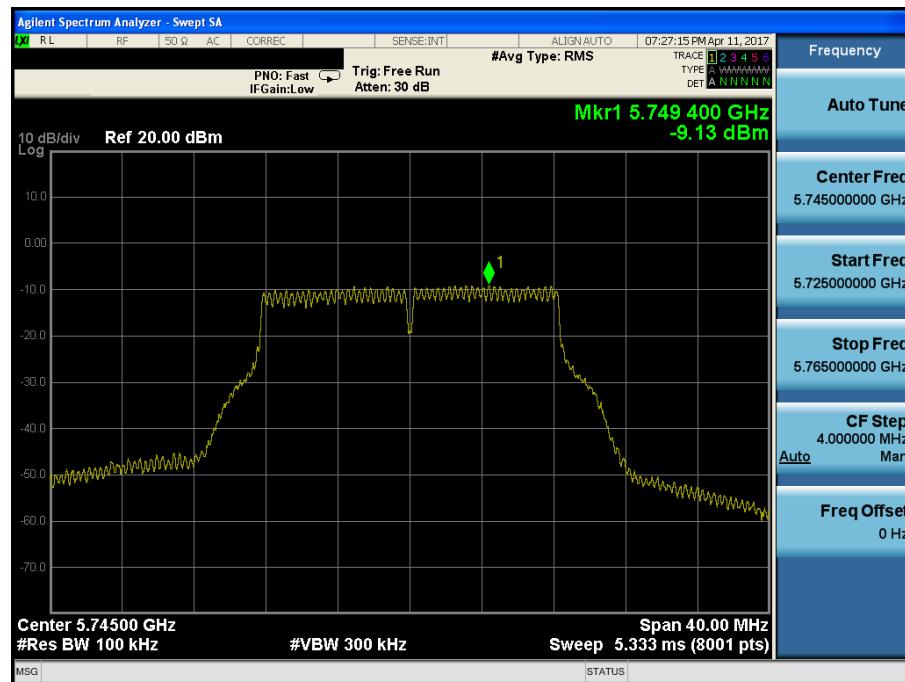
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.144



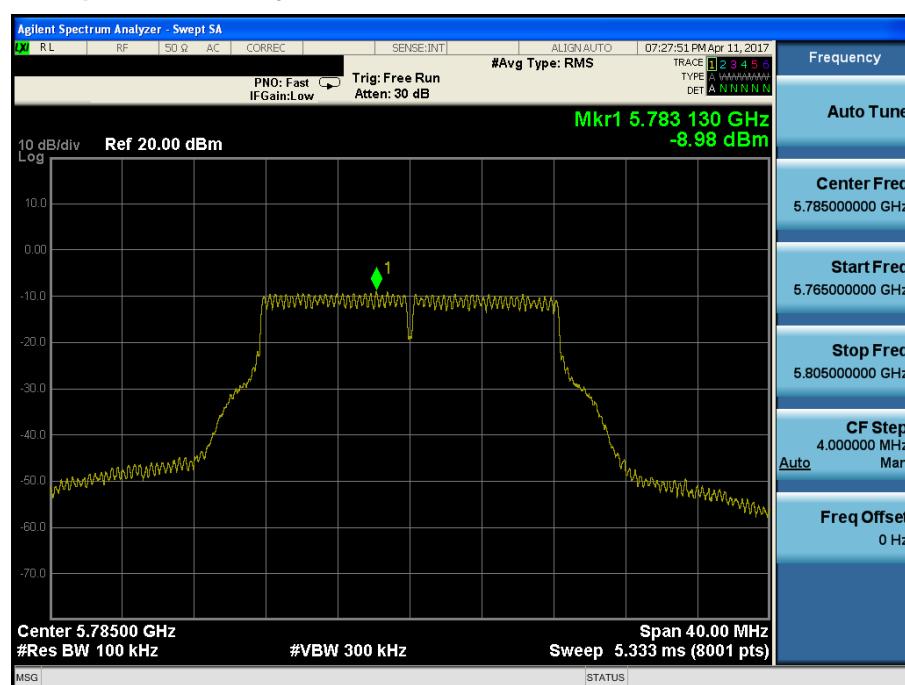
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.149



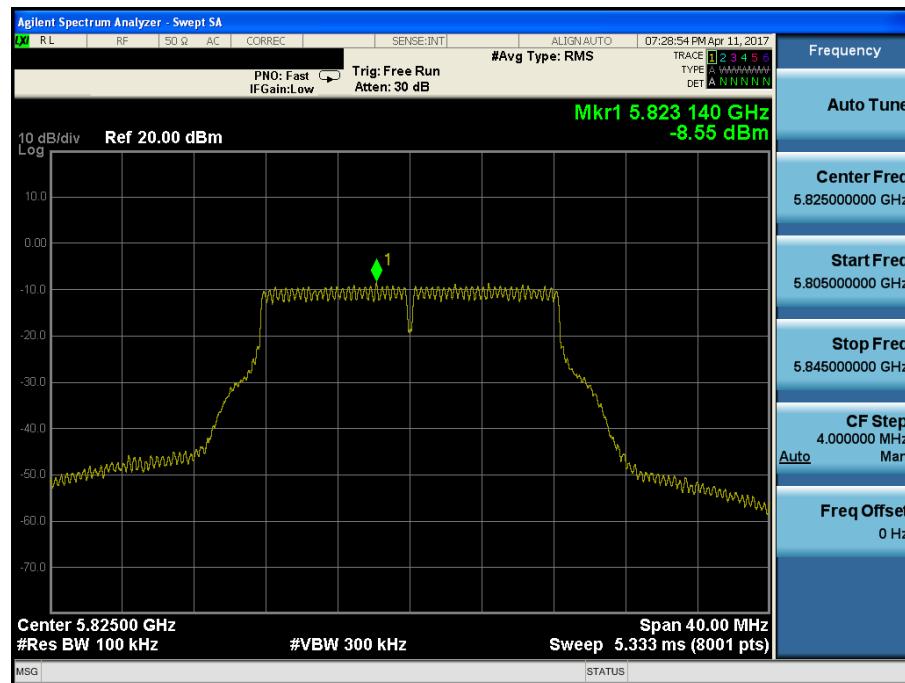
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.157



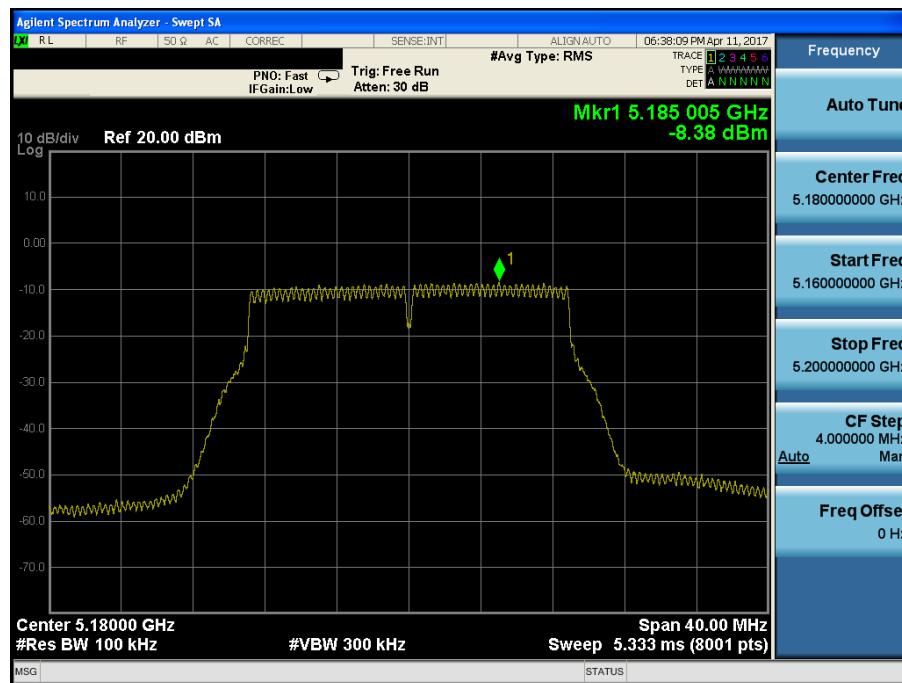
## Maximum Power Spectral Density

Test Mode: 802.11a &amp; Ch.165



**Maximum Power Spectral Density**

Test Mode: 802.11n(HT20) &amp; Ch.36

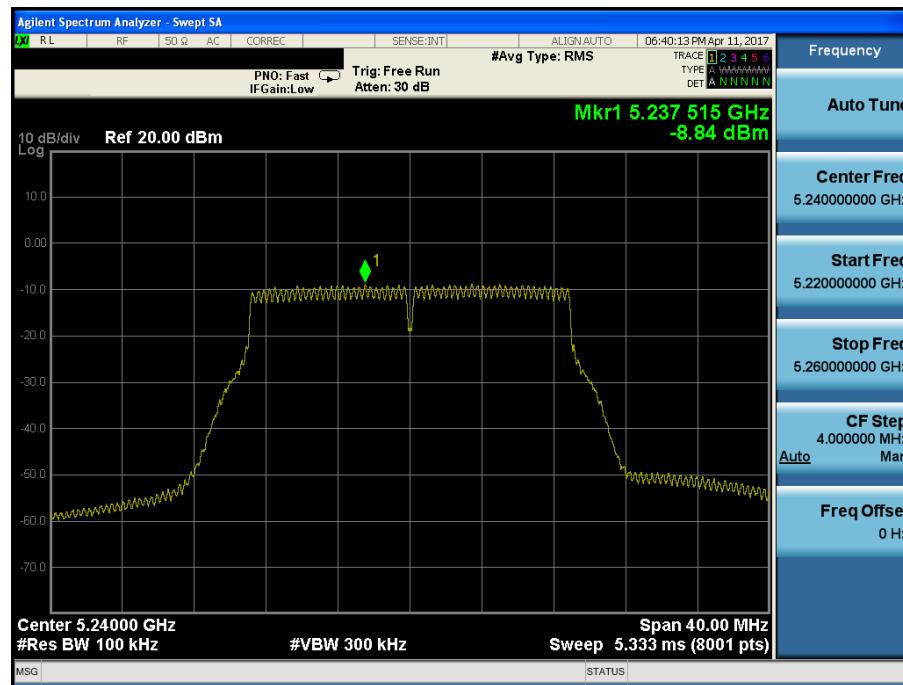

**Maximum Power Spectral Density**

Test Mode: 802.11n(HT20) &amp; Ch.40



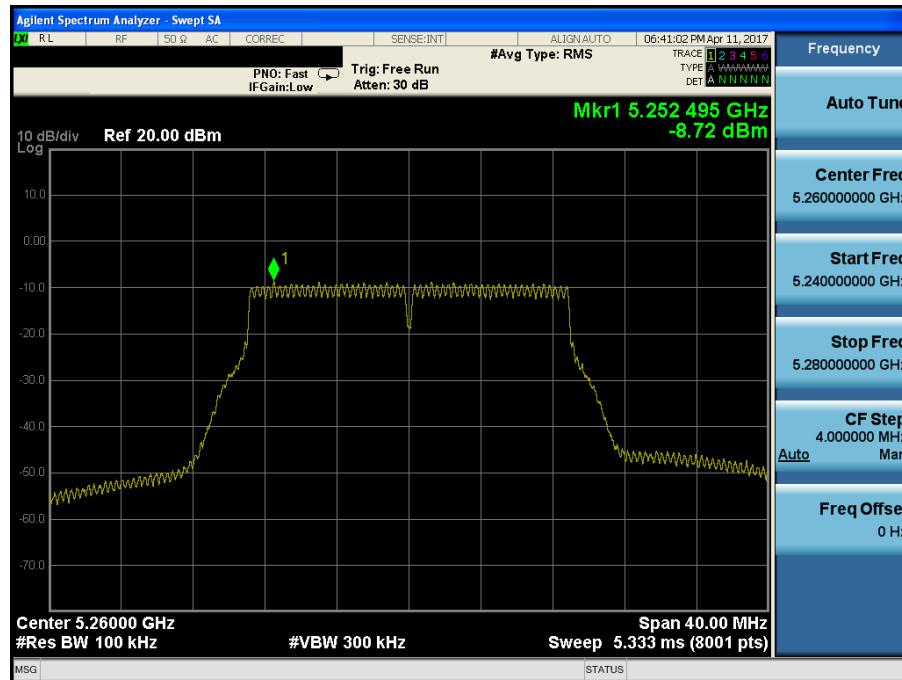
## Maximum Power Spectral Density

Test Mode: 802.11n(HT20) &amp; Ch.48



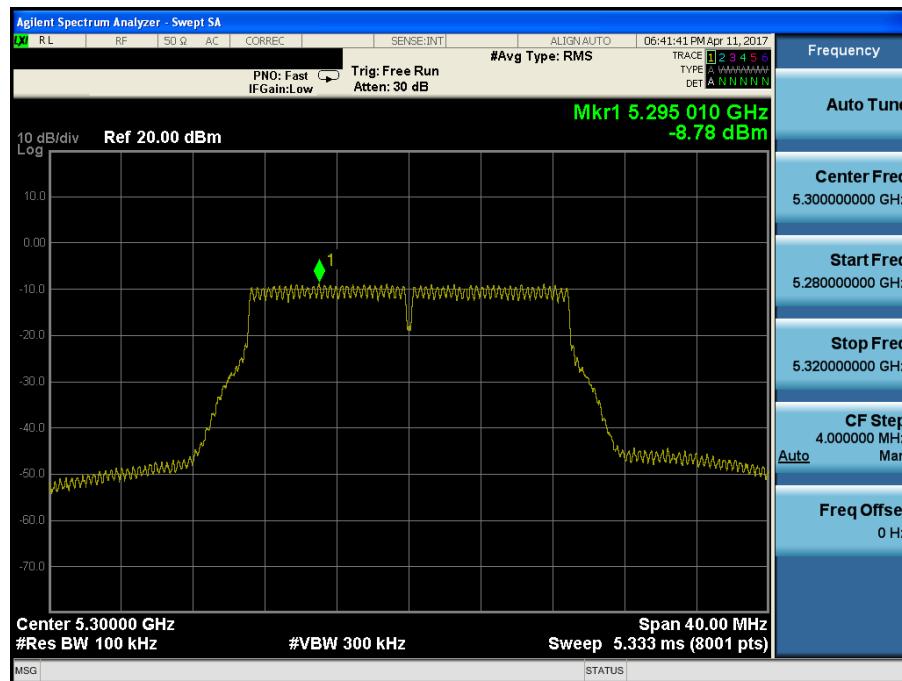
### Maximum Power Spectral Density

Test Mode: 802.11n(HT20) &amp; Ch.52



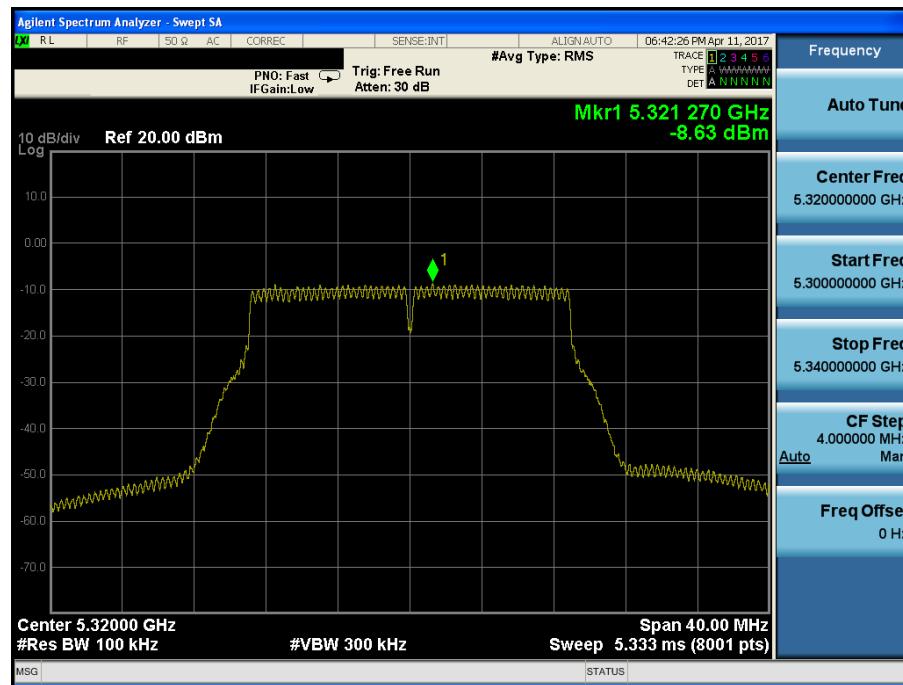
### Maximum Power Spectral Density

Test Mode: 802.11n(HT20) &amp; Ch.60



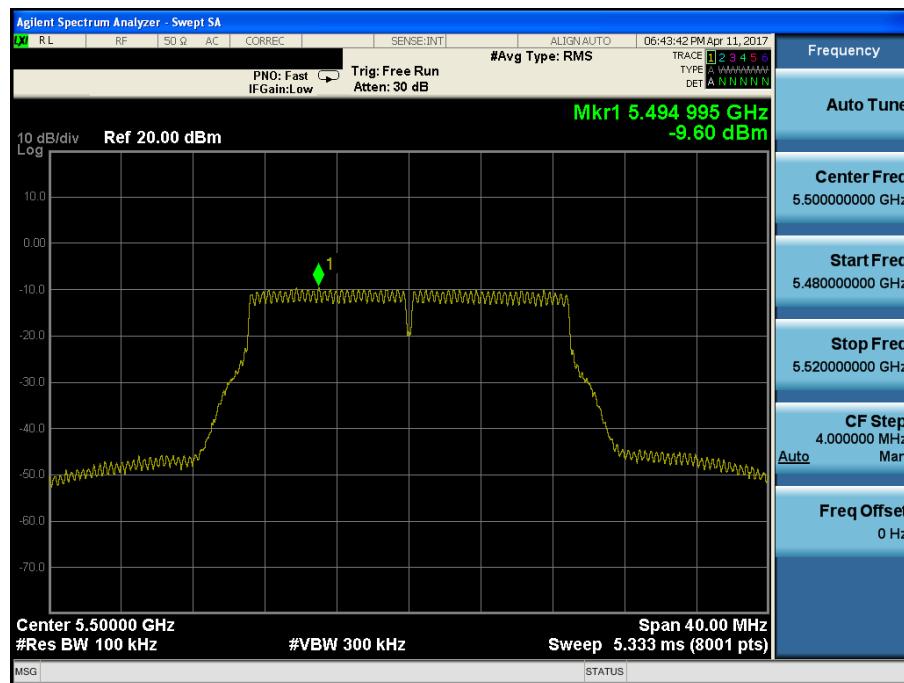
## Maximum Power Spectral Density

Test Mode: 802.11n(HT20) &amp; Ch.64



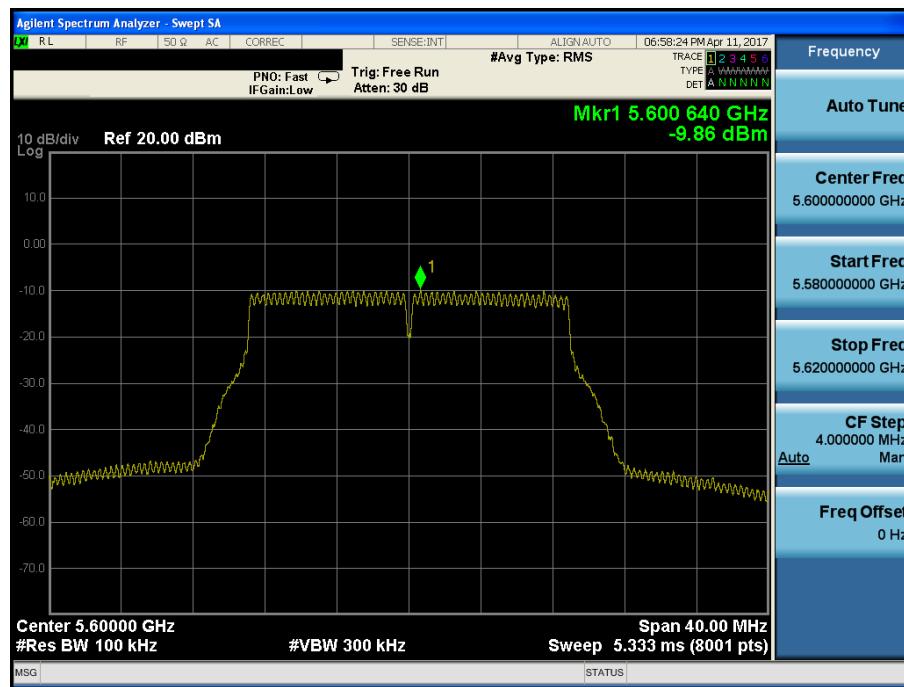
### Maximum Power Spectral Density

Test Mode: 802.11n(HT20) & Ch.100



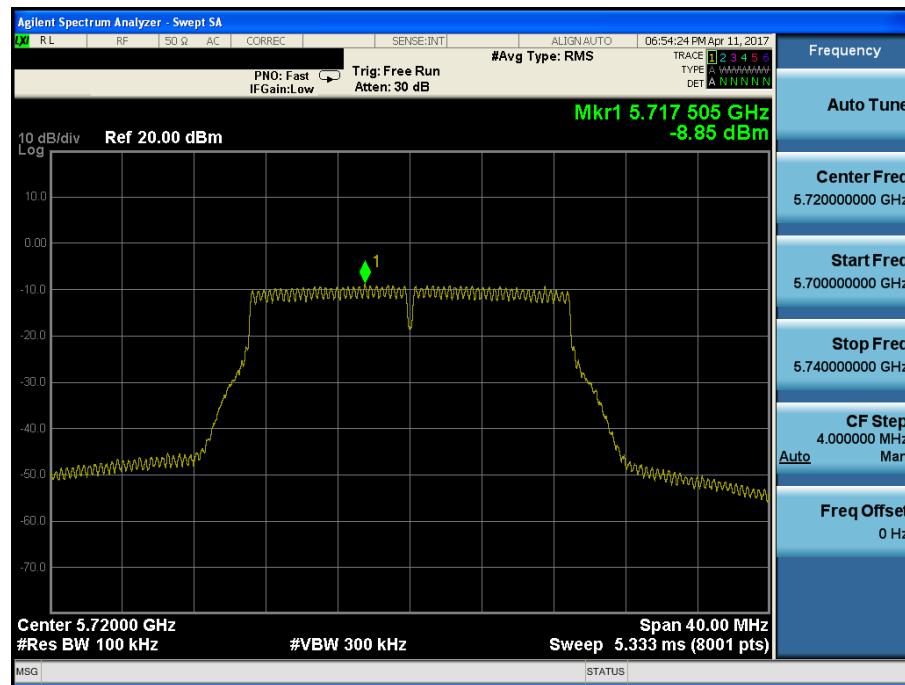
### Maximum Power Spectral Density

Test Mode: 802.11n(HT20) & Ch.120



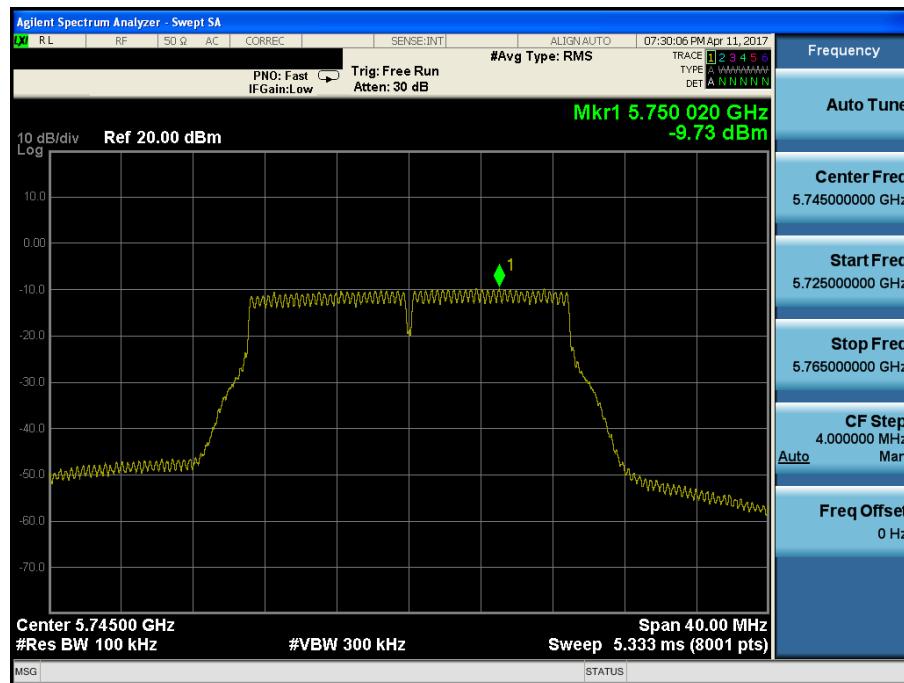
## Maximum Power Spectral Density

Test Mode: 802.11n(HT20) &amp; Ch.144



### Maximum Power Spectral Density

Test Mode: 802.11n(HT20) & Ch.149



### Maximum Power Spectral Density

Test Mode: 802.11n(HT20) & Ch.157

