


# TEST REPORT

<b>DT&amp;C Co., Ltd.</b> 42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel : 031-321-2664, Fax : 031-321-1664	Report No : DRTFCC1601-0007 Pages:(1) / (147) page	 <b>Dt&amp;C</b>
<p>1. Customer</p> <ul style="list-style-type: none"><li>• Name : Hyundai MOBIS Co., Ltd.</li><li>• Address : 203 Teheran-ro, Gangnam-gu, Seoul, Korea, 135-977</li></ul> <p>2. Use of Report : FCC &amp; IC Original Grant</p> <p>3. Product Name (FCCID, IC) : DIGITAL CAR AVN SYSTEM (TQ8-AC140C6AN, 5074A-AC1B0C6KN)</p> <p>4. Date of Test : 2015-10-21 ~ 2015-12-23</p> <p>5. Test Method Used : FCC Part 15 Subpart C.407 RSS-247 Issue 1 (2015-05), RSS-GEN Issue 4 (2014-11)</p> <p>6. Testing Environment : See appended test report</p> <p>7. Test Result : <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail</p> <p>The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.</p>		
Affirmation	Tested by Name : KwiCheol Yeom (Signature)	Technical Manager Name : GeunKi Son (Signature)
<p style="text-align: center;"><b>2016 . 1 . 12 .</b></p> <p style="text-align: center;"><b>DT&amp;C Co., Ltd.</b></p>		

## Test Report Version

Test Report No.	Date	Description
DRTFCC1601-0007	Jan. 12, 2016	Initial issue

## **CONTENTS**

<b>1. EUT Description.....</b>	<b>4</b>
<b>2. Information about test items.....</b>	<b>5</b>
2.1 Test mode / Channel Information.....	5
2.2 Tested Channel Information.....	5
2.3 Auxiliary equipment .....	6
2.4 Tested environment .....	6
2.5 EMI Suppression Device(s) / Modifications .....	6
<b>3. Summary of Tests.....</b>	<b>7</b>
<b>4. Test Methodology .....</b>	<b>8</b>
4.1 EUT configuration .....	8
4.2 EUT exercise.....	8
4.3 General test procedures.....	8
4.4 Description of test modes .....	8
<b>5. Instrument Calibration.....</b>	<b>9</b>
<b>6. Facilities and Accreditations .....</b>	<b>9</b>
6.1 Facilities .....	9
6.2 Equipment.....	9
<b>7. Antenna Requirements.....</b>	<b>9</b>
<b>8. TEST RESULT .....</b>	<b>10</b>
8.1 Emission Bandwidth (26 dB Bandwidth) .....	10
8.2 Minimum Emission Bandwidth (6 dB Bandwidth).....	32
8.3 Maximum Conducted Output Power.....	41
8.4 Maximum Power Spectral Density.....	51
8.5 Frequency Stability.....	82
8.6 Radiated Spurious Emission Measurements .....	85
8.7 AC Conducted Emissions.....	96
8.8 Occupied Bandwidth .....	97
<b>9. List of Test Equipment .....</b>	<b>124</b>
<b>APPENDIX I .....</b>	<b>125</b>
<b>APPENDIX II .....</b>	<b>125</b>
<b>APPENDIX III .....</b>	<b>128</b>

## 1. EUT Description

<b>FCC Equipment Class</b>	Unlicensed National Information Infrastructure (UNII)
<b>Product</b>	DIGITAL CAR AVN SYSTEM
<b>Model Name</b>	FCC: AC140C6AN IC: AC1B0C6KN
<b>Add Model Name</b>	NA
<b>Hardware version</b>	4.0.
<b>Software version</b>	1.0 .
<b>Power Supply</b>	DC 14.4 V
<b>Frequency Range</b>	<b>U-NII 1(5150 ~ 5250MHz)</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): 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> : Internal Antenna <b>Antenna gain</b> <ul style="list-style-type: none"> <li>▪ U-NII 1 : 2.890 dBi</li> <li>▪ U-NII 2C : 2.890 dBi</li> <li>▪ U-NII 2A : 2.510 dBi</li> <li>▪ U-NII 3 : 5.780 dBi</li> </ul>

## 2. Information about test items

### 2.1 Test mode / Channel Information

5GHz Band	Mode	Data Rate
U-NII 1	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 2A	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	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
	802.11n(HT40)	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(HT40)		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	-	-
	116	5580	110	5550	106	5530
	140	5700	134	5670	-	-
U-NII 3	149	5745	151	5755	-	-
	157	5785	-	-	155	5775
	165	5825	159	5795	-	-

5GHz Band	802.11a/n(HT20)		802.11n(HT40)		802.11ac(VHT80)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 2C/ U-NII 3	144	5720	142	5710	138	5690

## 2.3 Auxiliary equipment

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

## 2.4 Tested environment

Temperature	: 21 °C ~ 24 °C
Relative humidity content	: 40 % ~ 42 % R.H.
Details of power supply	: DC 14.4 V

## 2.5 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)	RSS Std.	Parameter	Limit	Test Condition	Status Note 1
<b>I. Transmitter Mode (TX)</b>					
15.407(a)	-	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	<b>C</b>
15.407(e)	RSS-247[6.2.4]	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz in 5725 ~ 5850 MHz		<b>C</b>
-	RSS GEN[6.6]	Occupied Bandwidth (99%)	N/A		
15.407(a)	RSS-247[6.2]	Maximum Conducted Output Power	5150 ~ 5250 MHz : < 30 dBm or < 23.97 dBm (FCC) < 200 mW or $10 + 10\log_{10}(B)$ dBm whichever power is less. (IC) 5250 ~ 5350 & 5470 ~ 5725 MHz : < 250 mW or $11 + 10\log_{10}(B)$ dBm, whichever power is less. (FCC & IC) 5725 ~ 5850 MHz : < 30 dBm (FCC & IC) Note: B is the 99 % BW(IC) or 26dB BW(FCC).		<b>C</b> Note 3
15.407(a)	RSS-247[6.2]	Peak Power Spectral Density	5150 ~ 5250 MHz : 11 dBm/MHz or 17 dBm/MHz(FCC) 5150 ~ 5250 MHz: < 10 dBm/MHz 5250 ~ 5350 & 5470 ~ 5725 MHz: 11 dBm/MHz (FCC & IC) 5725 ~ 5850 MHz: 30 dBm/500kHz(FCC & IC)		<b>C</b> Note 4
15.407(g)	RSS GEN[6.11]	Frequency Stability	N/A		<b>C</b>
15.407(b)	RSS-247[6.2]	Undesirable Emissions	5150 ~ 5725 MHz: < -27 dBm/MHz EIRP 5725 ~ 5850 MHz: < -17 dBm/MHz EIRP or < -27 dBm/MHz EIRP	Radiated	<b>C</b> Note 5
15.205 15.209 15.407(b)	RSS-247[6.2] RSS-GEN[8.9] RSS-GEN[8.10]	General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		<b>C</b> Note 6
15.407(h)	RSS-247[6.3]	Dynamic Frequency Selection	FCC 15.407(h)	Conducted	<b>C</b> Note 7
15.207	RSS-GEN[8.8]	AC Conducted Emissions	FCC 15.207	AC Line Conducted	<b>NA</b> Note 8
15.203	-	Antenna Requirements	FCC 15.203	-	<b>C</b>

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: For transmitters operating in the 5.725 - 5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz

Note 6: These test items were performed in each axis and the worst case data was reported.

Note 7: Refer to the DFS test report.

Note 8: 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 v01. 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 v01. 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 v01. 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 v01.

The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm.

For emission measurements above 1 GHz, the table height is 1.5 m. 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. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axis.

### 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. Facilities and Accreditations

### 6.1 Facilities

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements..

- Semi anechoic chamber registration Number : 165783(FCC) & 5740A-3(IC)

### 6.2 Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, 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."

## 7. 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 antenna is permanently attached. (Refer to Internal photo file.)**

**Therefore this E.U.T Complies with the requirement of §15.203**

## 8. TEST RESULT

### 8.1 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 V01**.

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 %.

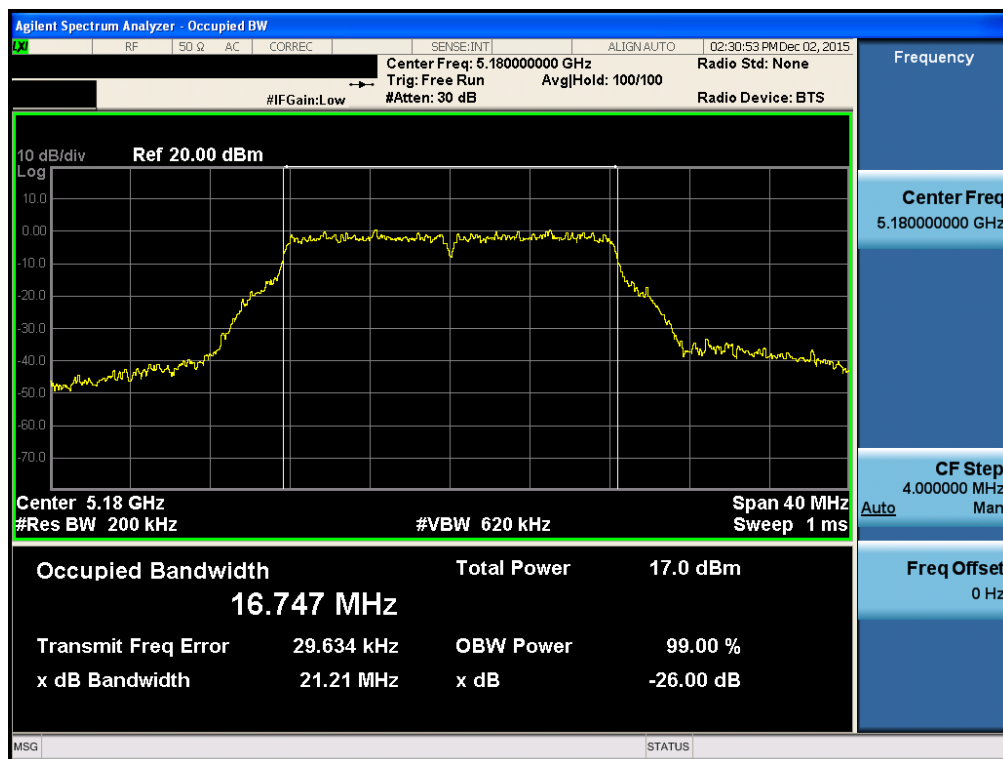
■ TEST RESULTS: **Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 1	36	5180	21.21
		40	5200	21.49
		48	5240	21.35
	U-NII 2A	52	5260	21.16
		60	5300	21.23
		64	5320	21.27
	U-NII 2C	100	5500	21.36
		116	5580	21.33
		140	5700	21.37
802.11n (HT20)	U-NII 1	36	5180	21.39
		40	5200	21.40
		48	5240	21.57
	U-NII 2A	52	5260	21.58
		60	5300	21.51
		64	5320	21.19
	U-NII 2C	100	5500	21.56
		116	5580	21.48
		140	5700	21.21
802.11n (HT40)	U-NII 1	38	5190	40.14
		46	5230	39.64
	U-NII 2A	54	5270	39.85
		62	5310	39.67
	U-NII 2C	102	5510	40.23
		110	5550	40.13
802.11ac (VHT80)	U-NII 1	134	5670	39.83
		142	5710	35.15
	U-NII 2A	42	5210	80.09
		-	-	-
	U-NII 2C	58	5290	81.12
		-	-	-
802.11a	Cross Band	106	5530	81.59
		-	-	-
802.11a	Cross Band	144	5720	15.81
		-	-	-
802.11n (HT20)	Cross Band	144	5720	15.78
		-	-	-
802.11n(HT40)	Cross Band	142	5710	35.15
		-	-	-
802.11ac (VHT80)	Cross Band	138	5690	76.05
		-	-	-

## ■ Result Plots

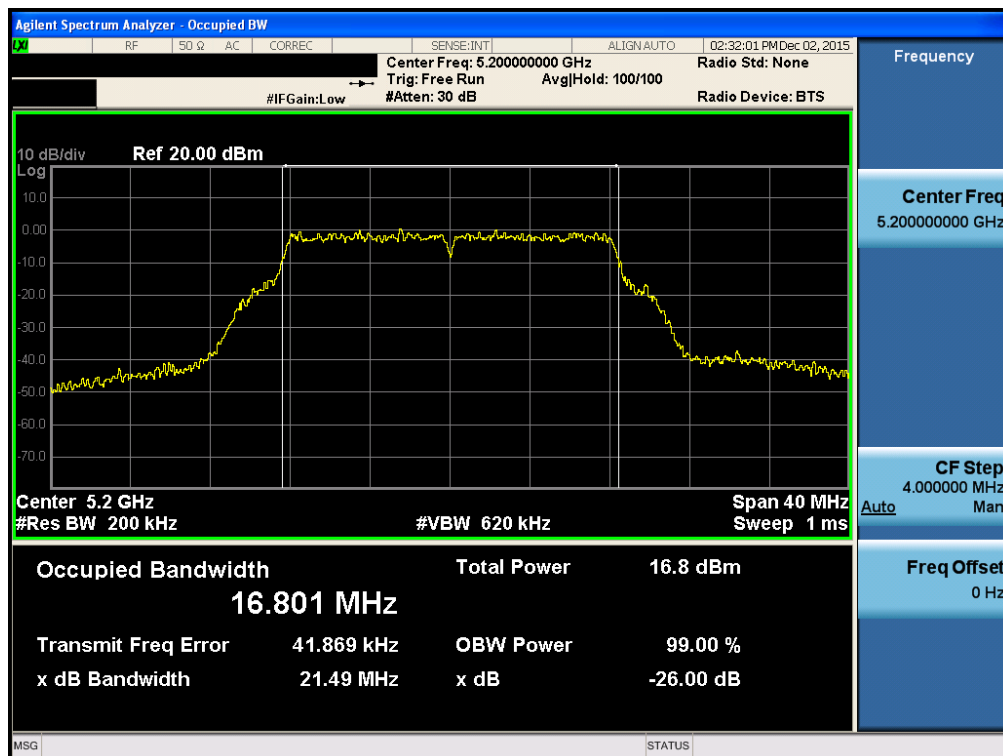
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.36



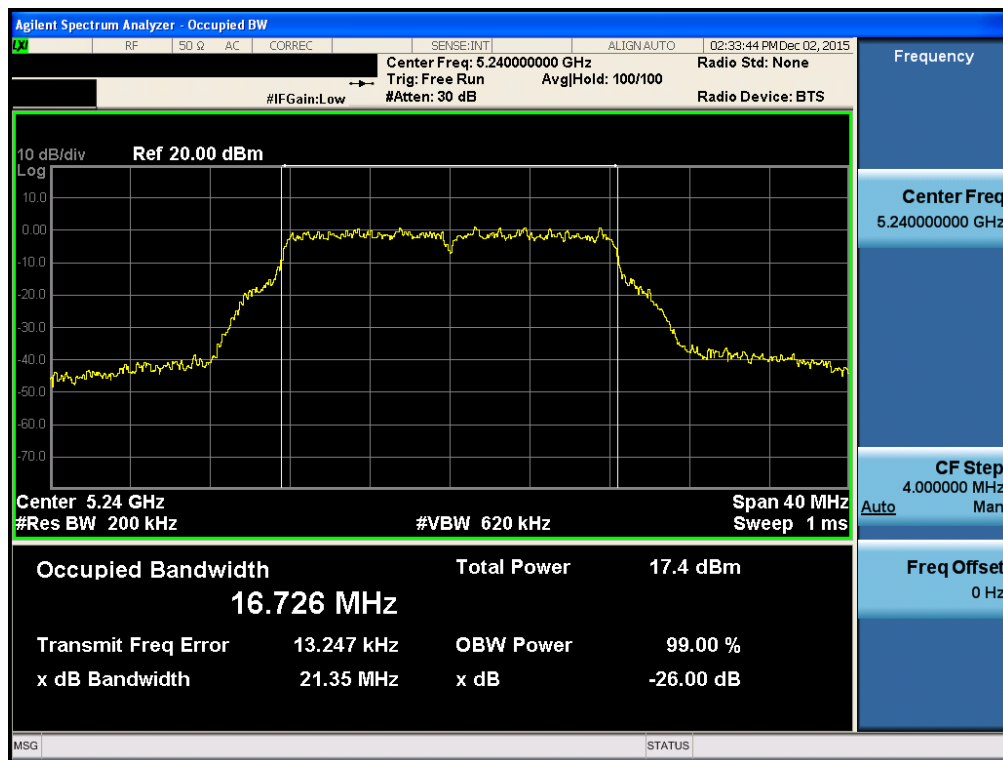
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.40



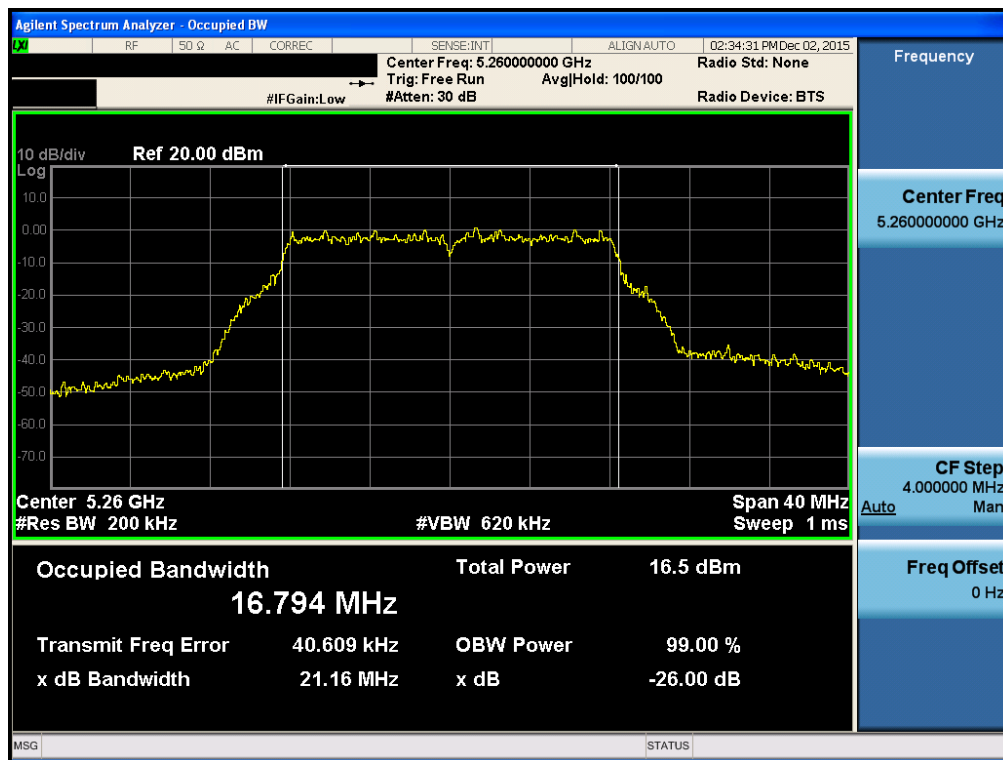
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.48



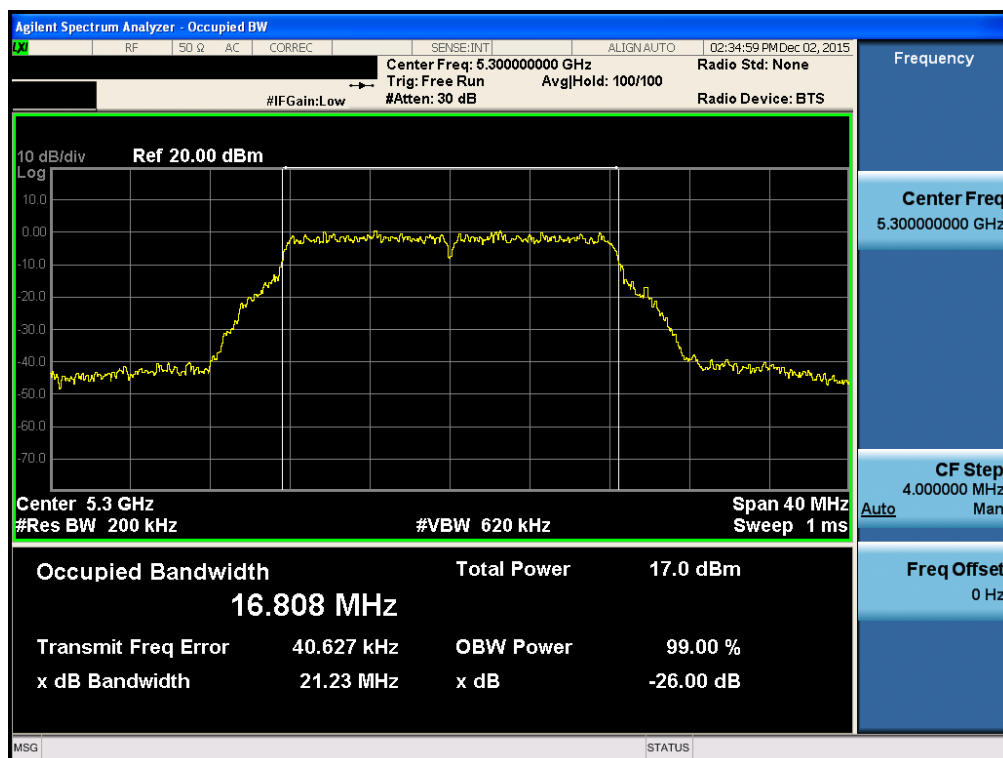
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.52



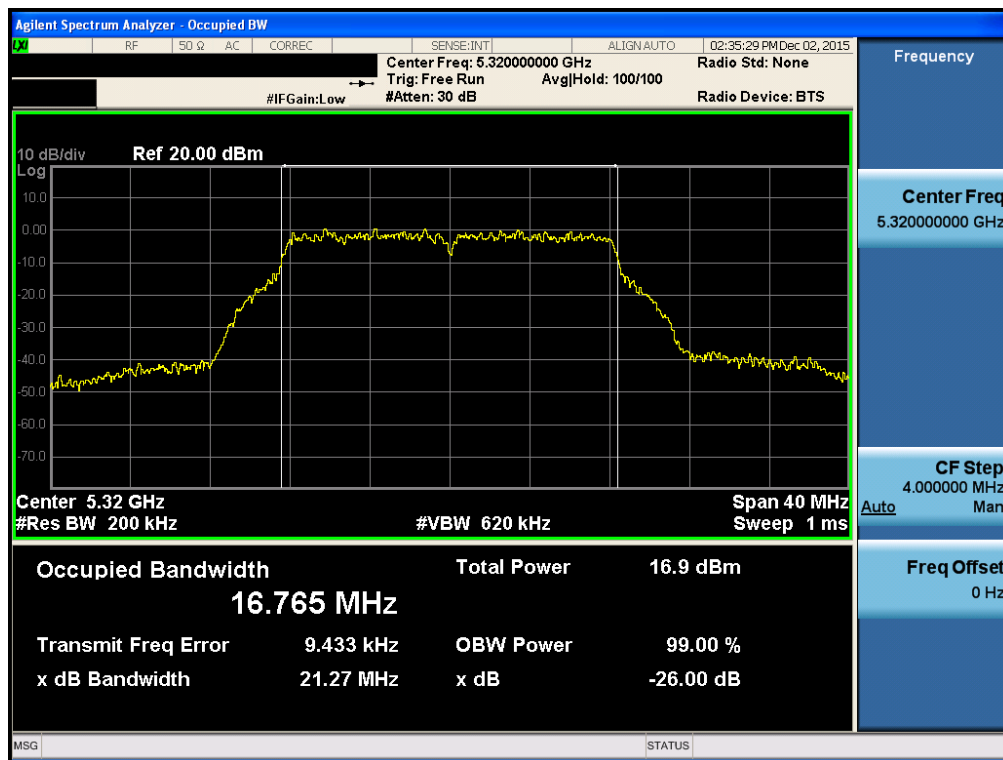
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.60



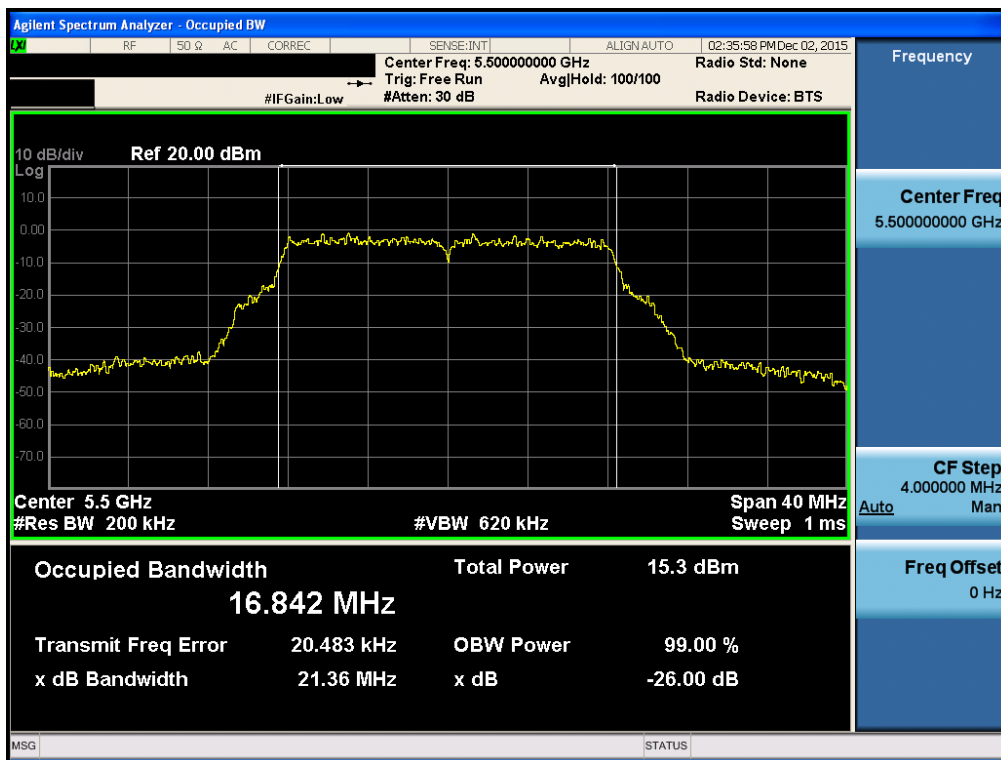
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.64



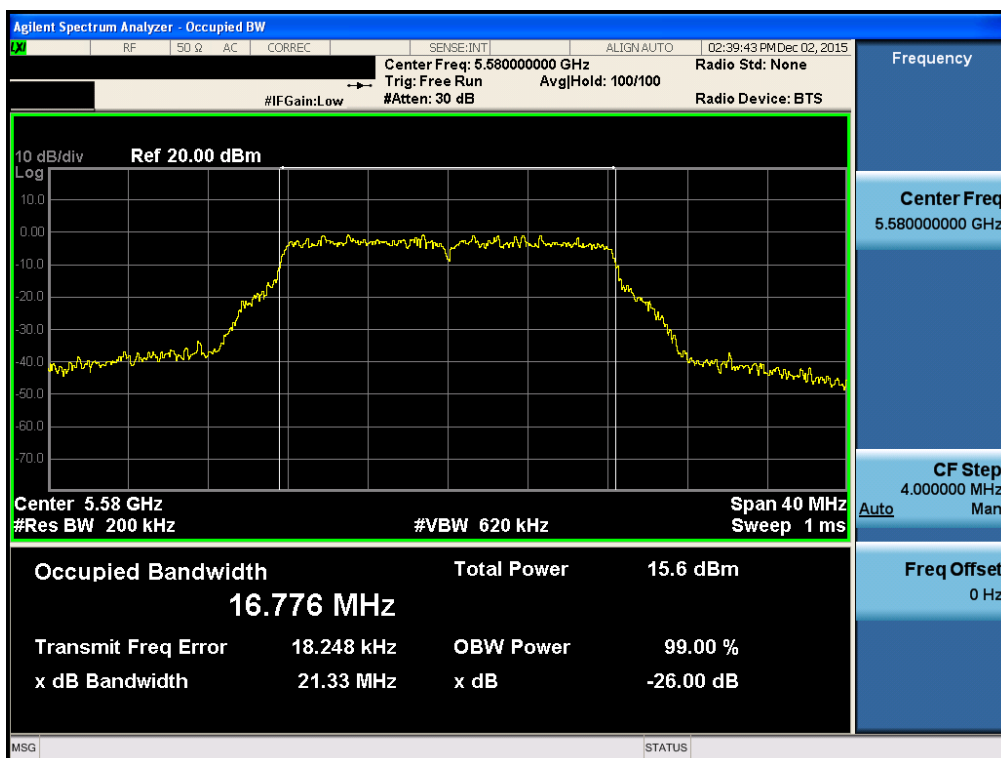
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.100



## 26 dB Bandwidth

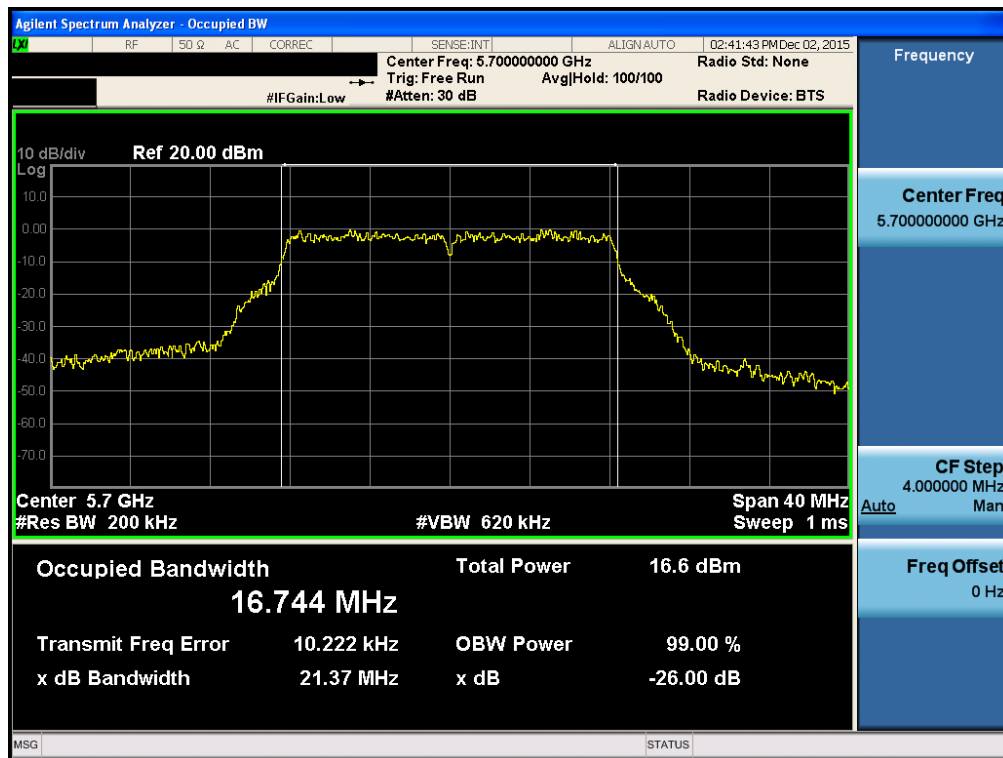
Test Mode: 802.11a &amp; Ch.116





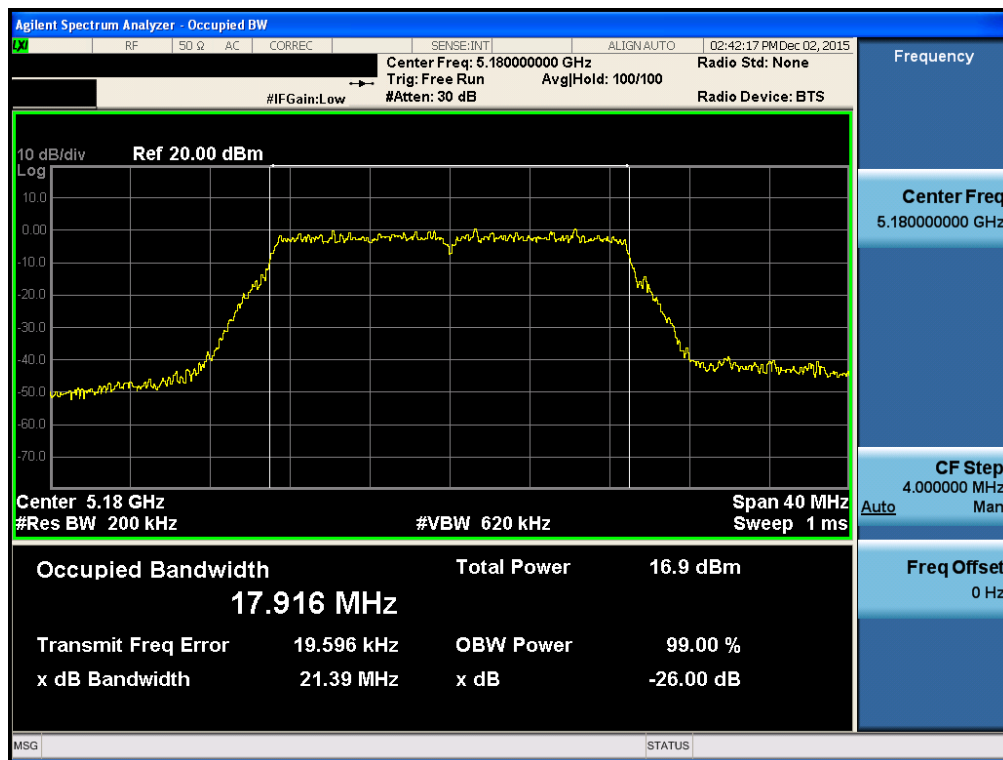
## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.140



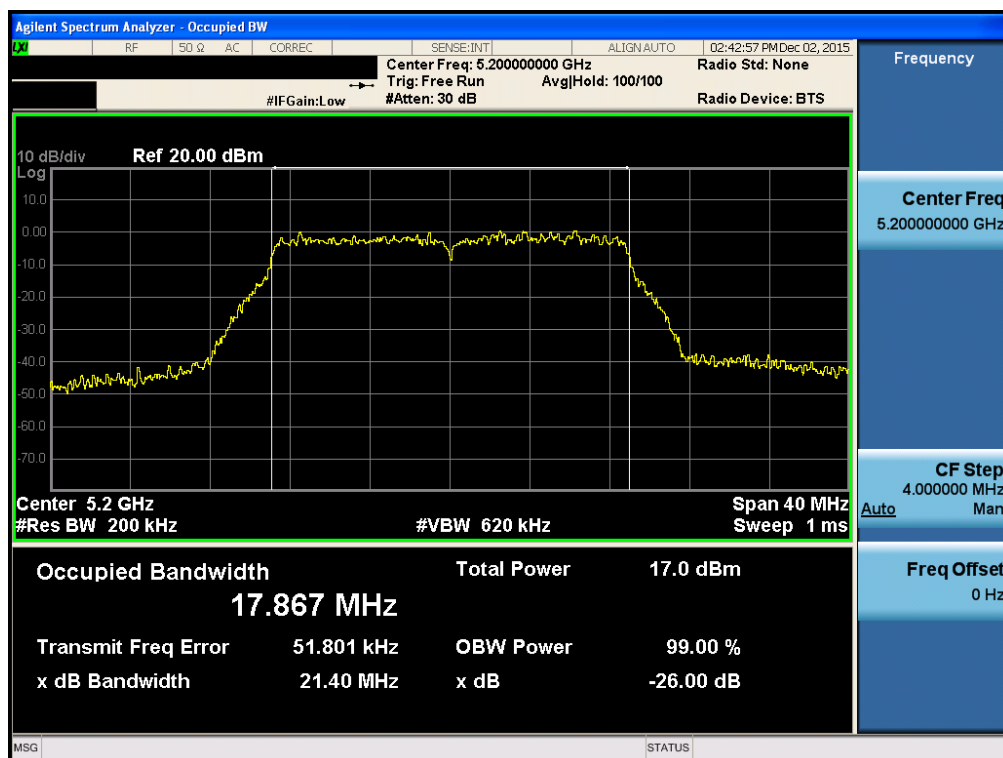
## 26 dB Bandwidth

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



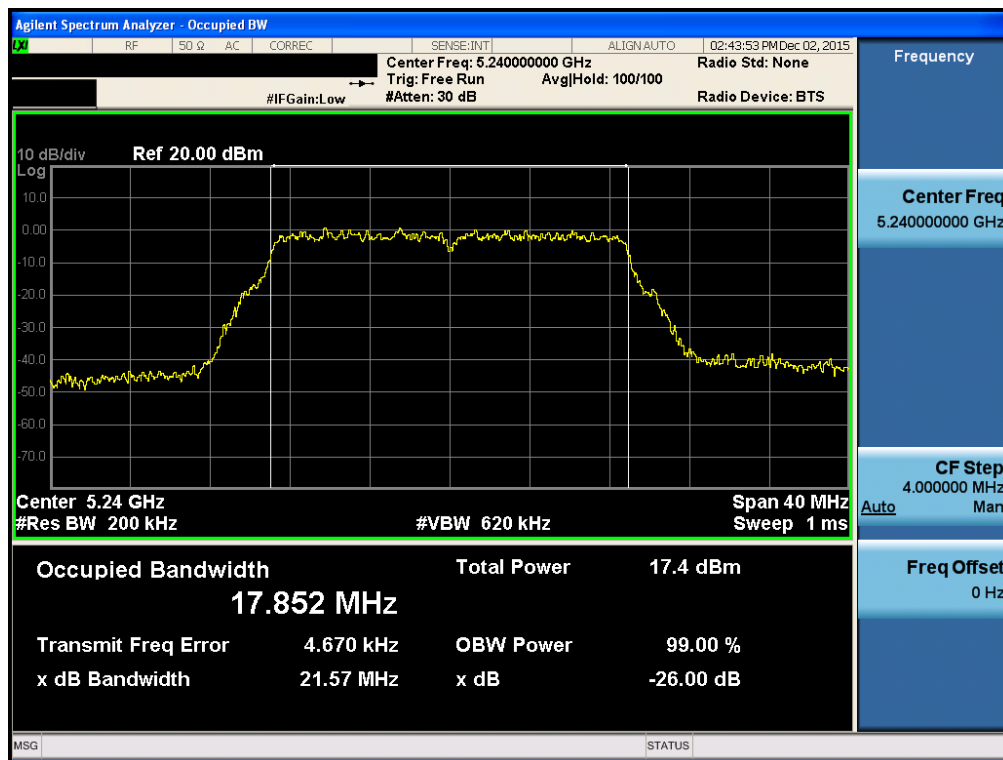
## 26 dB Bandwidth

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



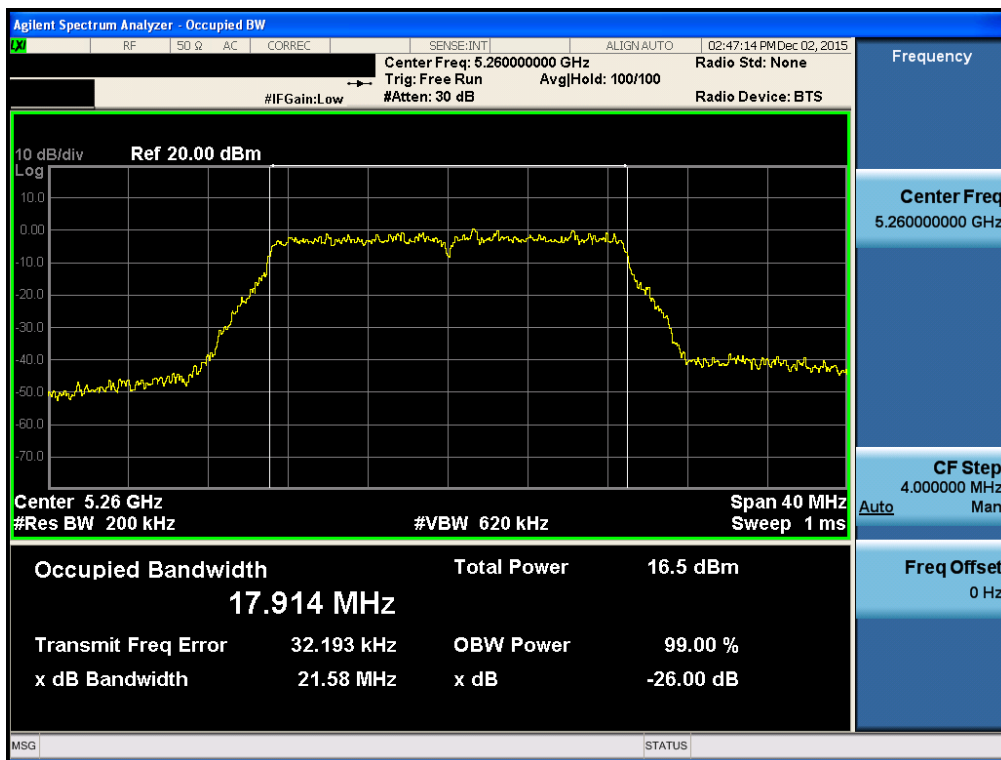
## 26 dB Bandwidth

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



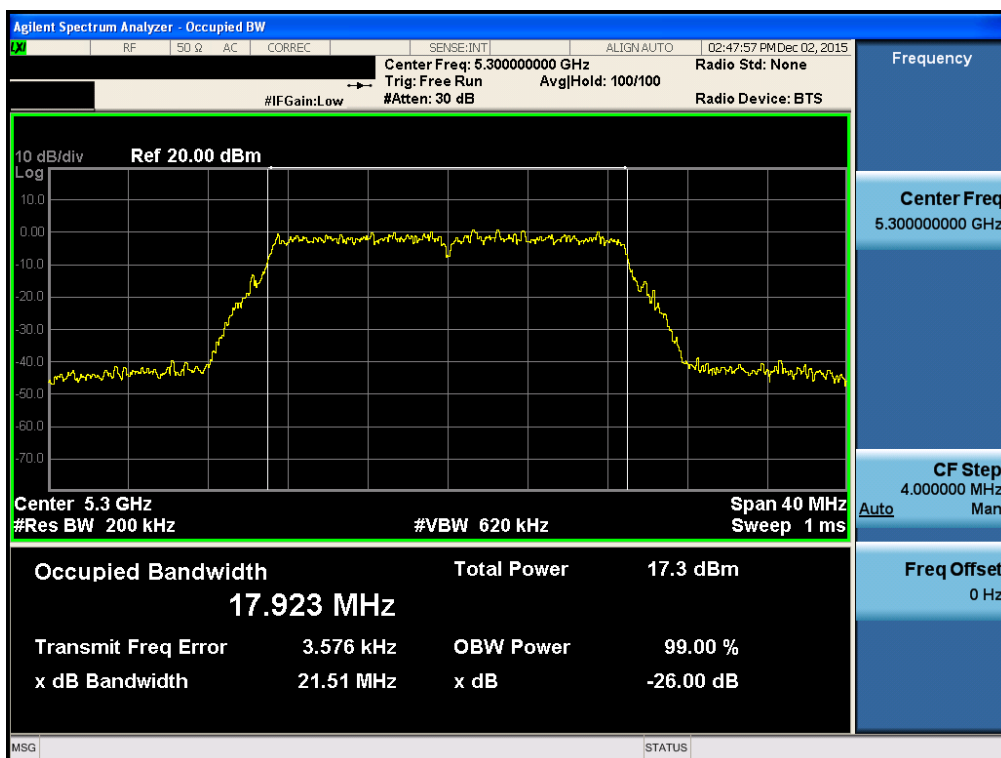
## 26 dB Bandwidth

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



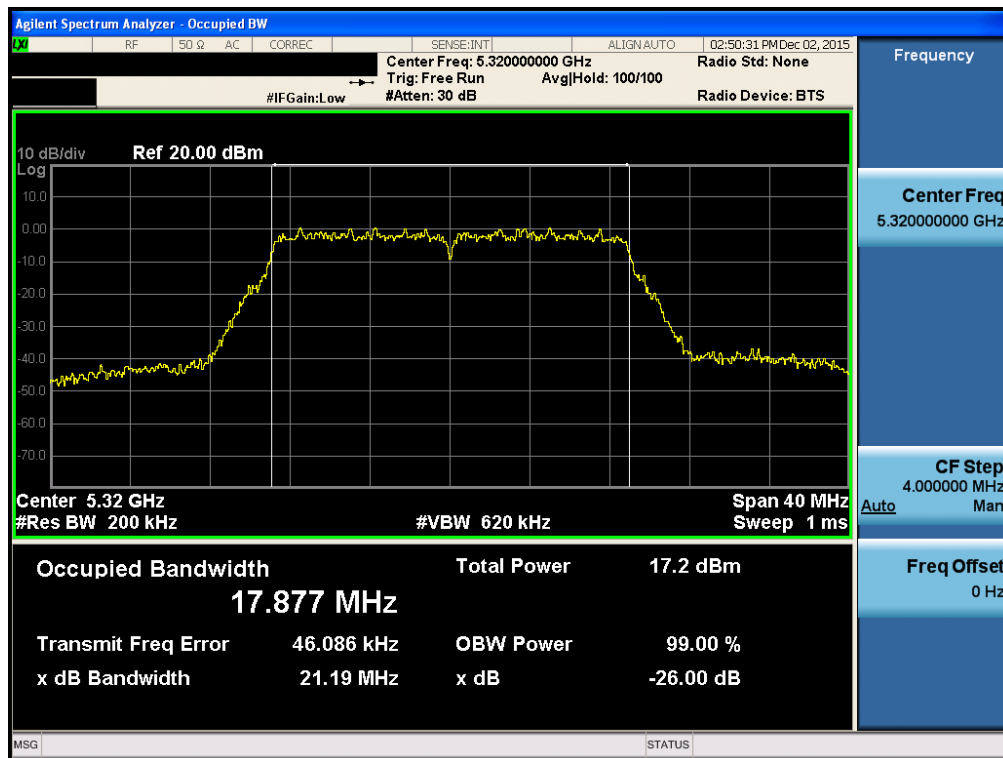
## 26 dB Bandwidth

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



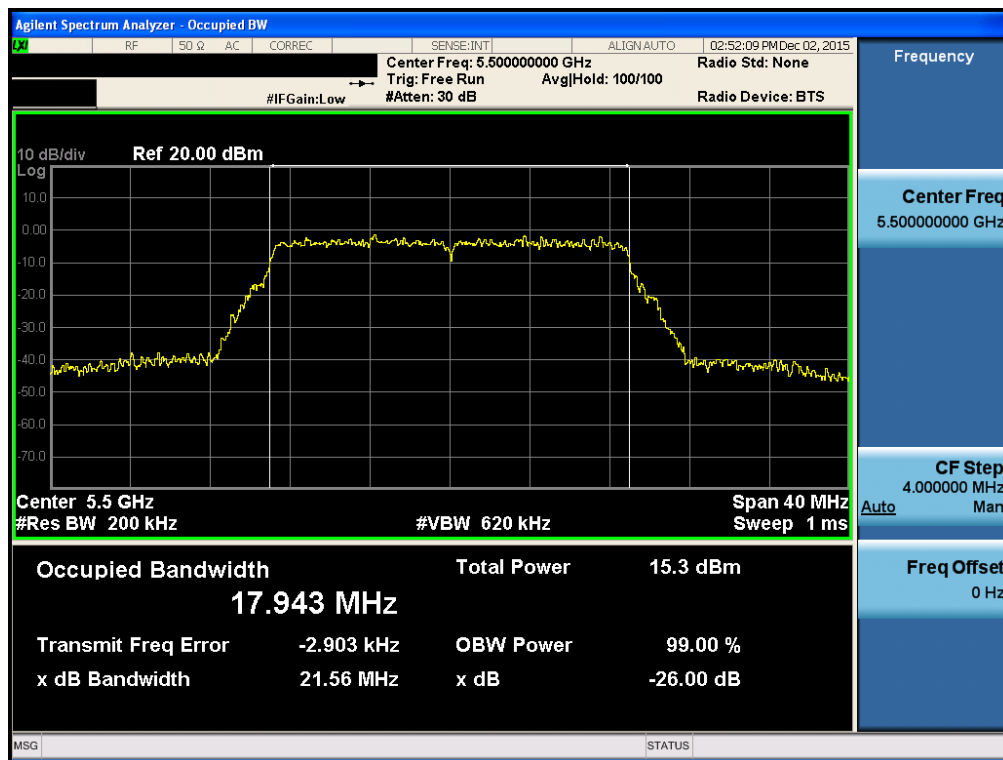
## 26 dB Bandwidth

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



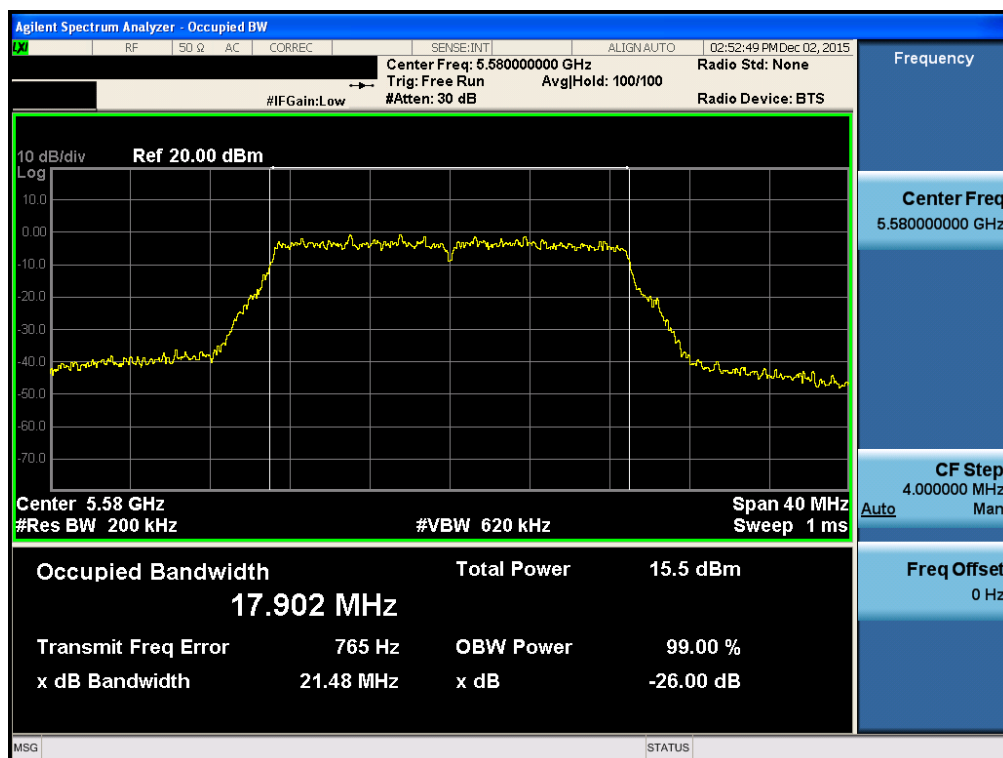
## 26 dB Bandwidth

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



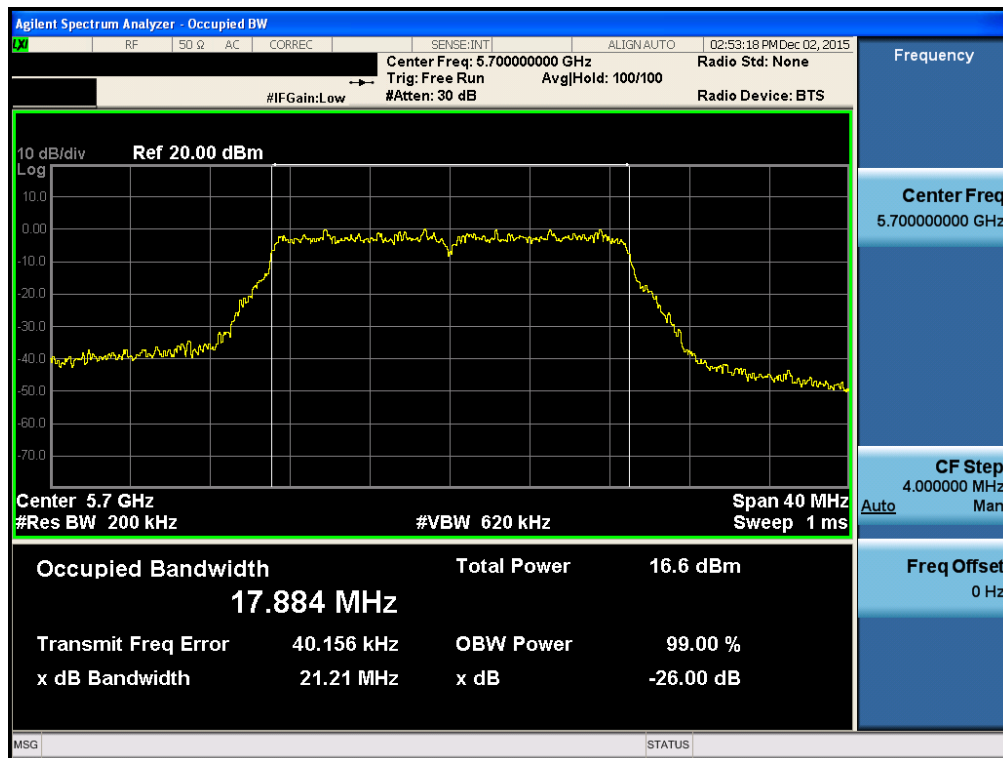
## 26 dB Bandwidth

Test Mode: 802.11n HT20 &amp; Ch.116



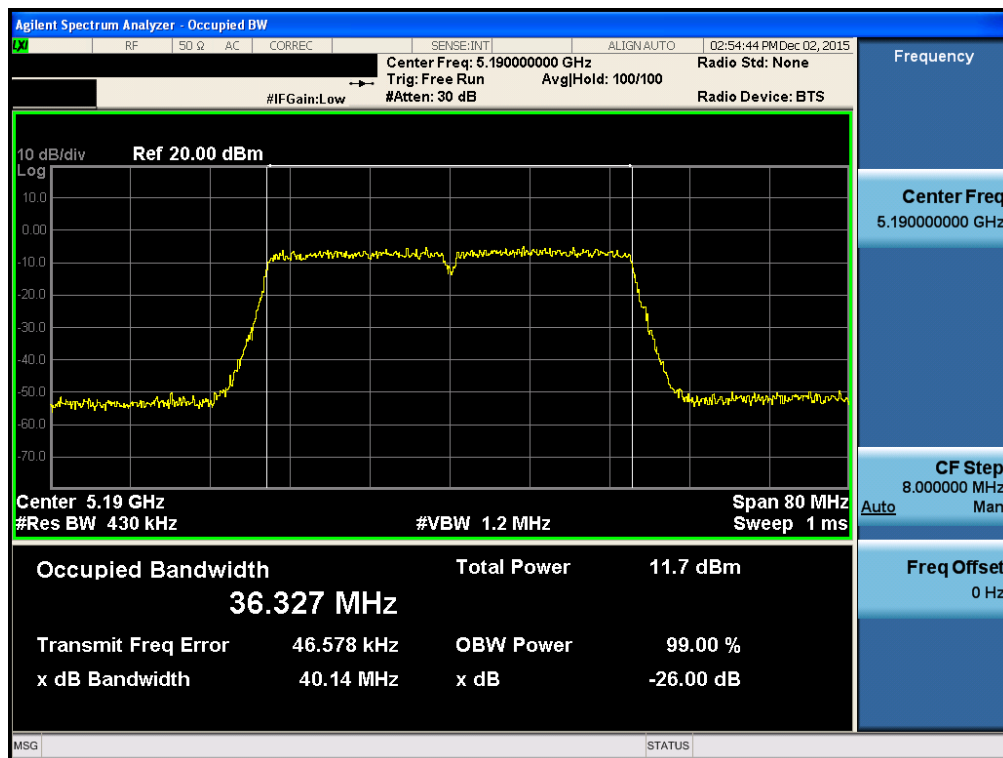
## 26 dB Bandwidth

Test Mode: 802.11n HT20 &amp; Ch.140



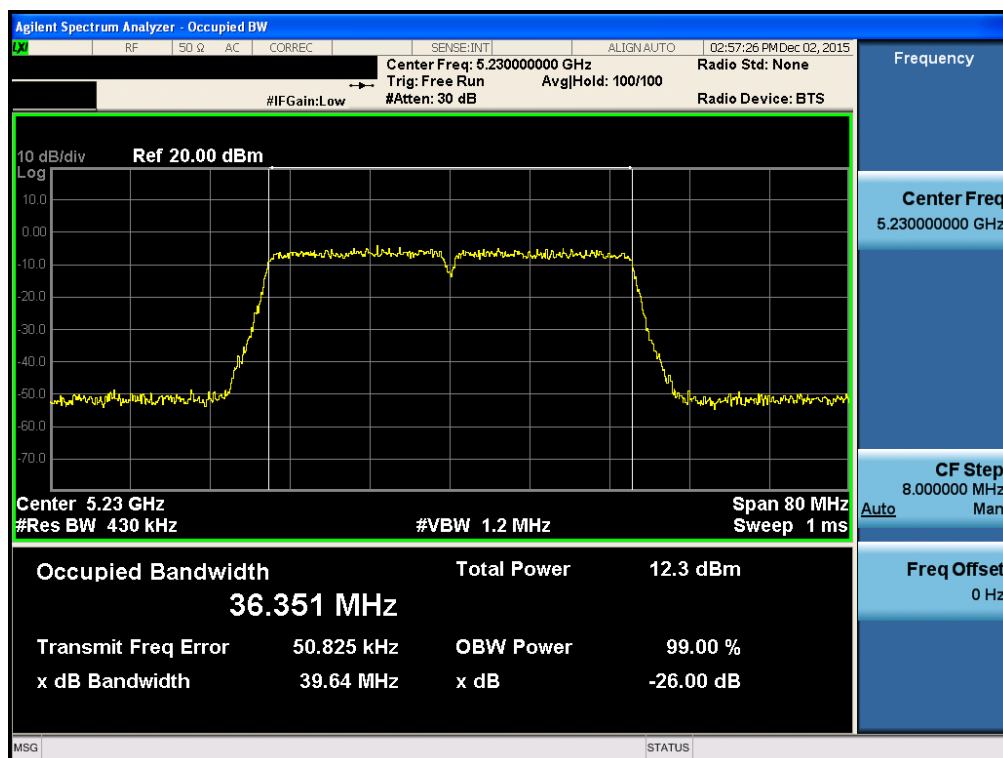
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.38



## 26 dB Bandwidth

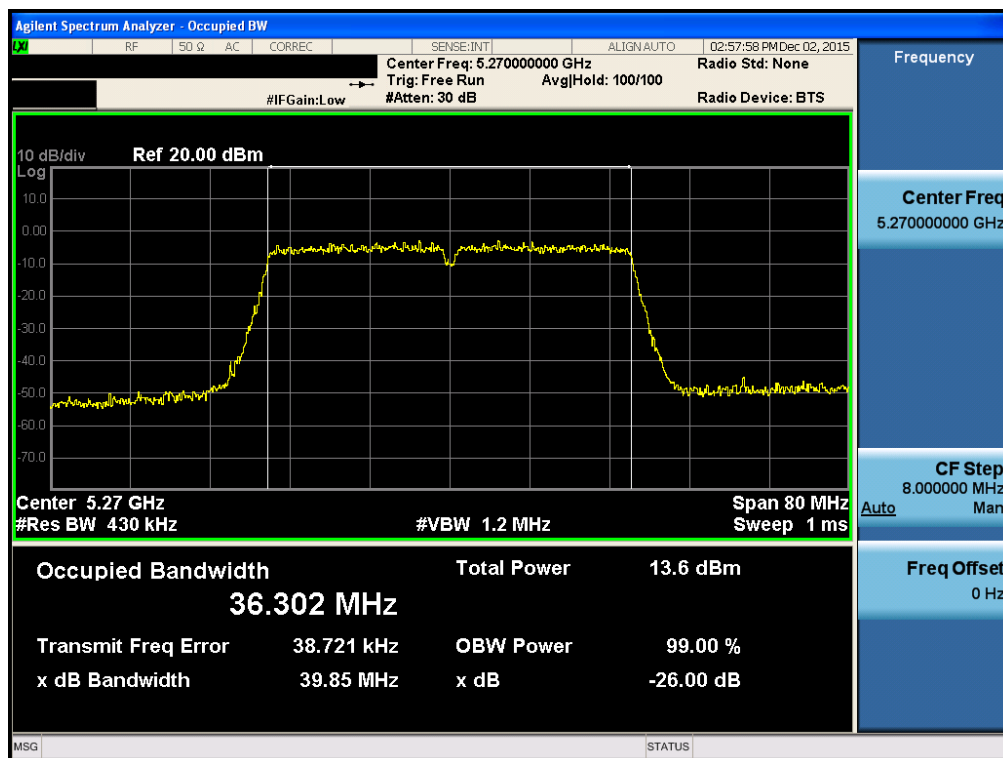
Test Mode: 802.11n HT40 &amp; Ch.46





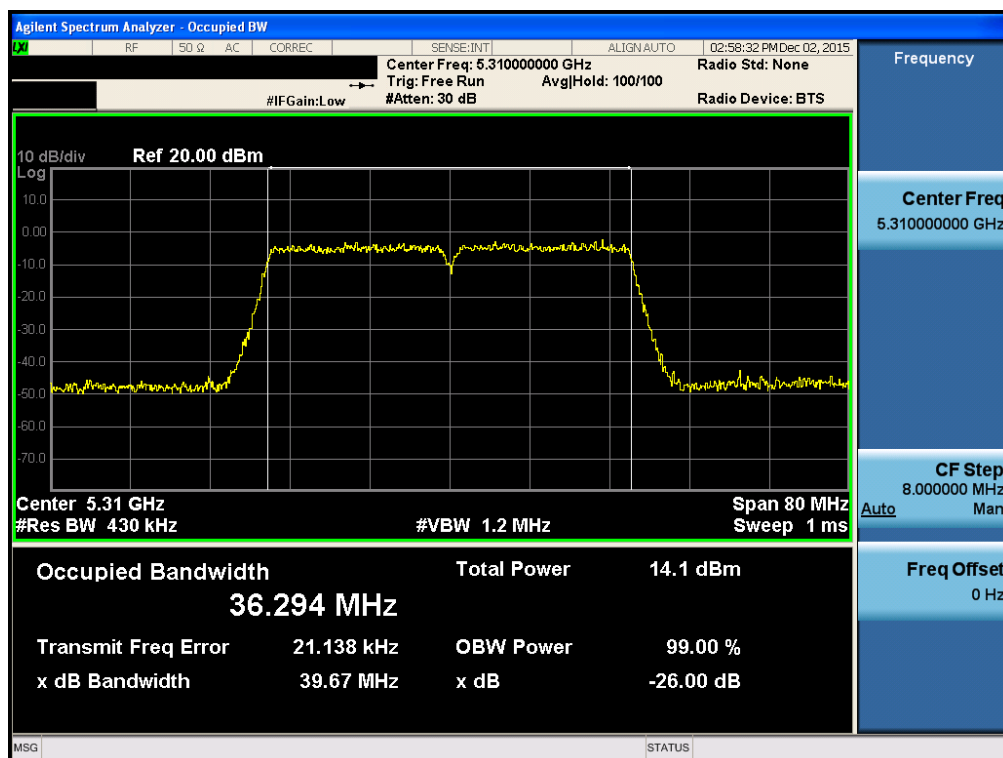
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.54



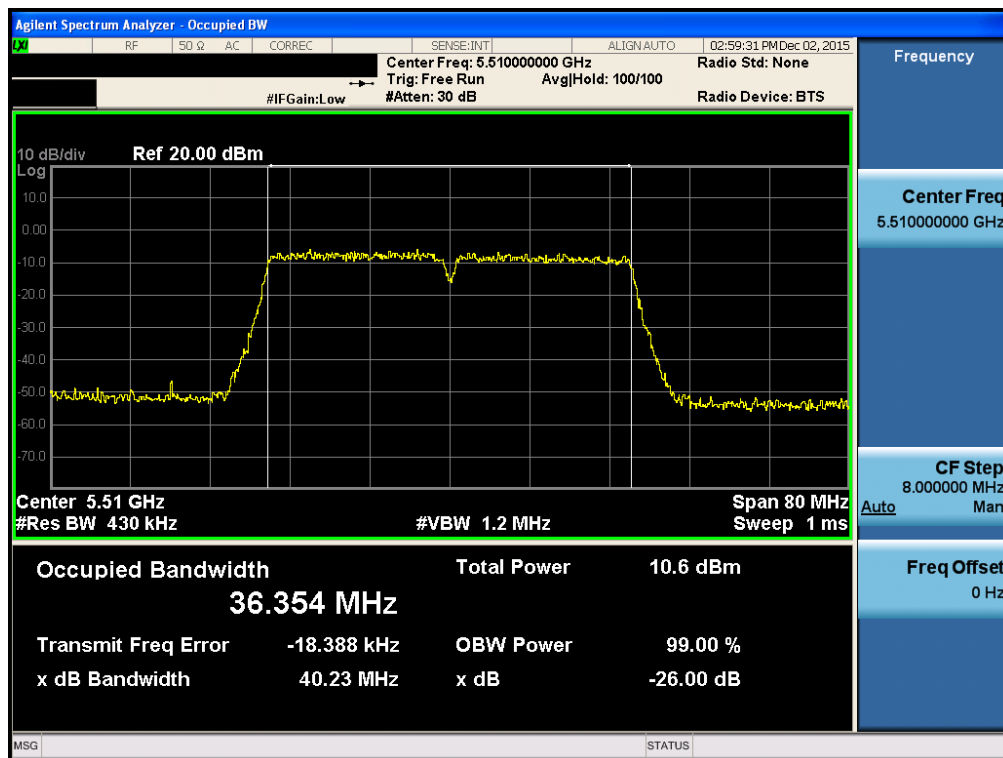
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.62



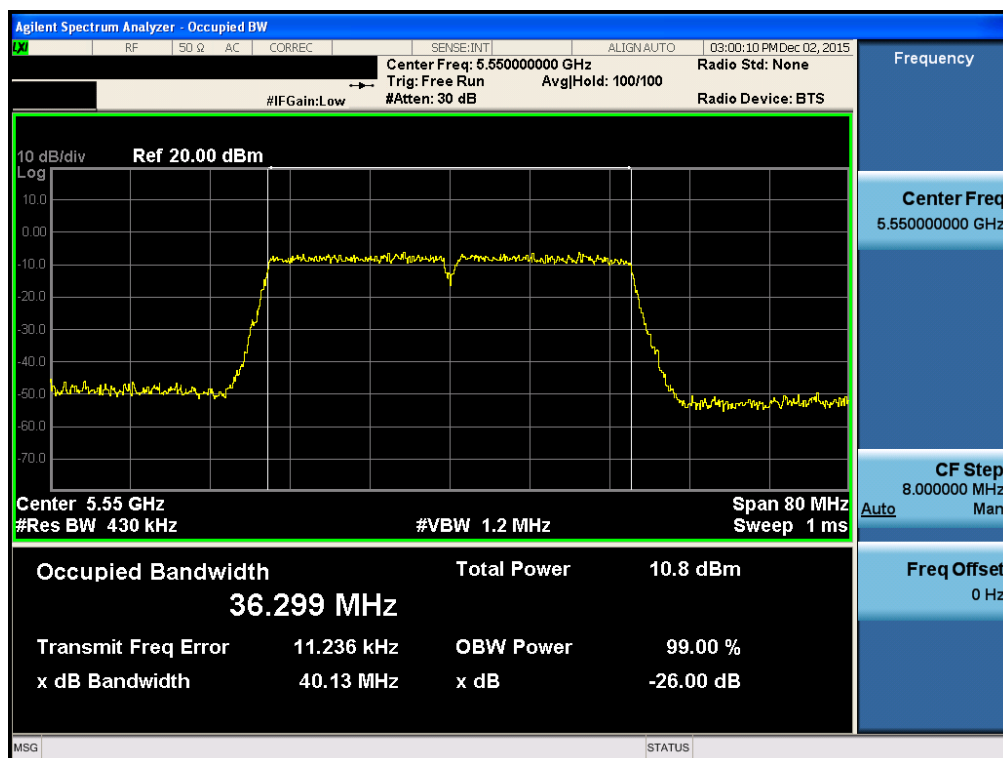
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.102



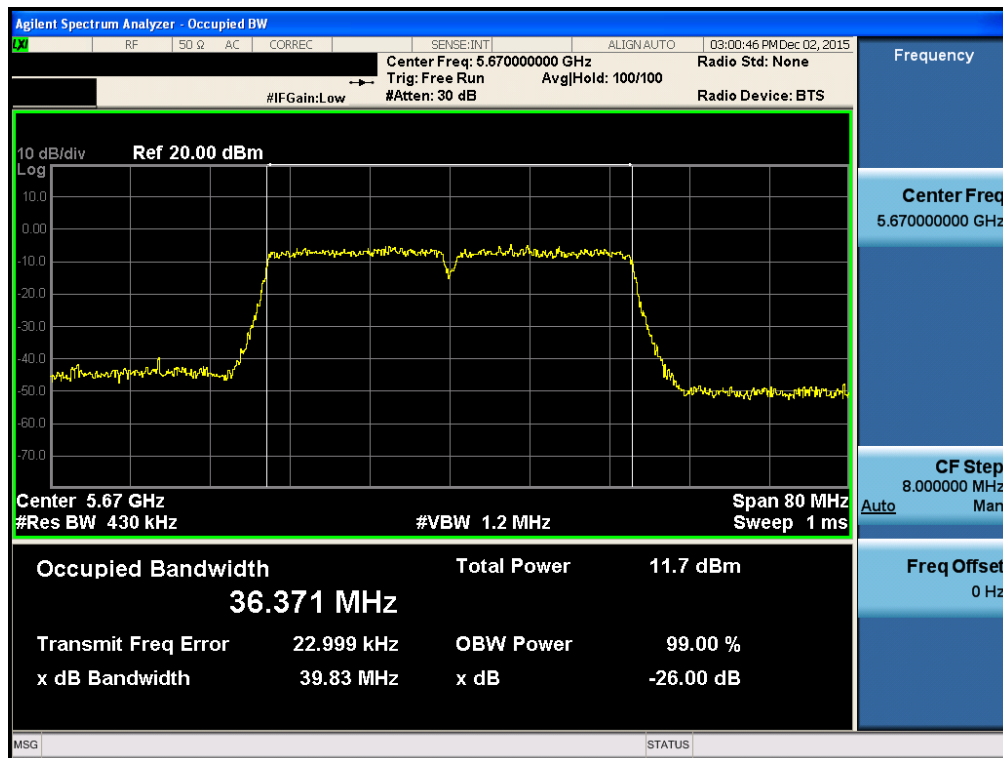
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.110



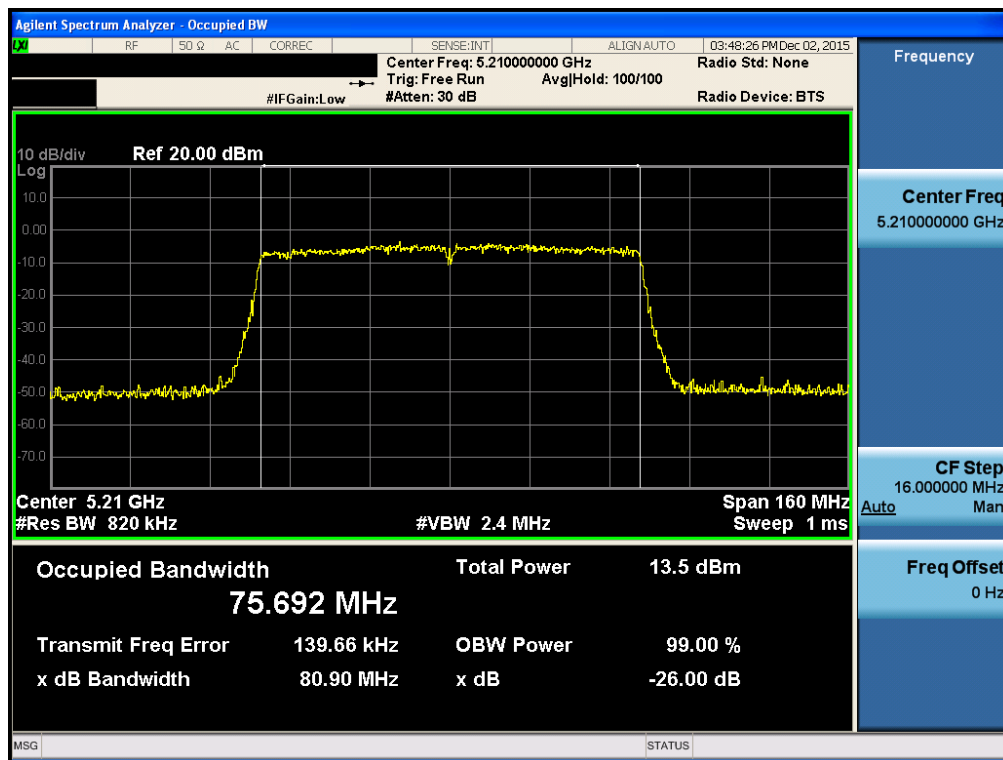
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.134



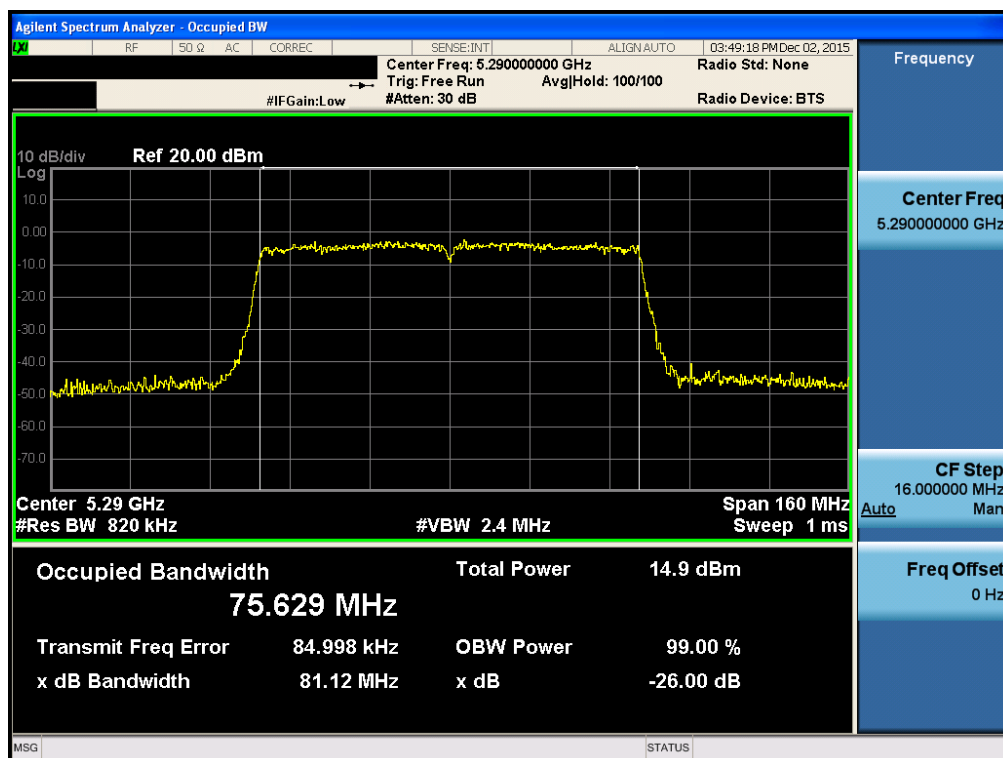
## 26 dB Bandwidth

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



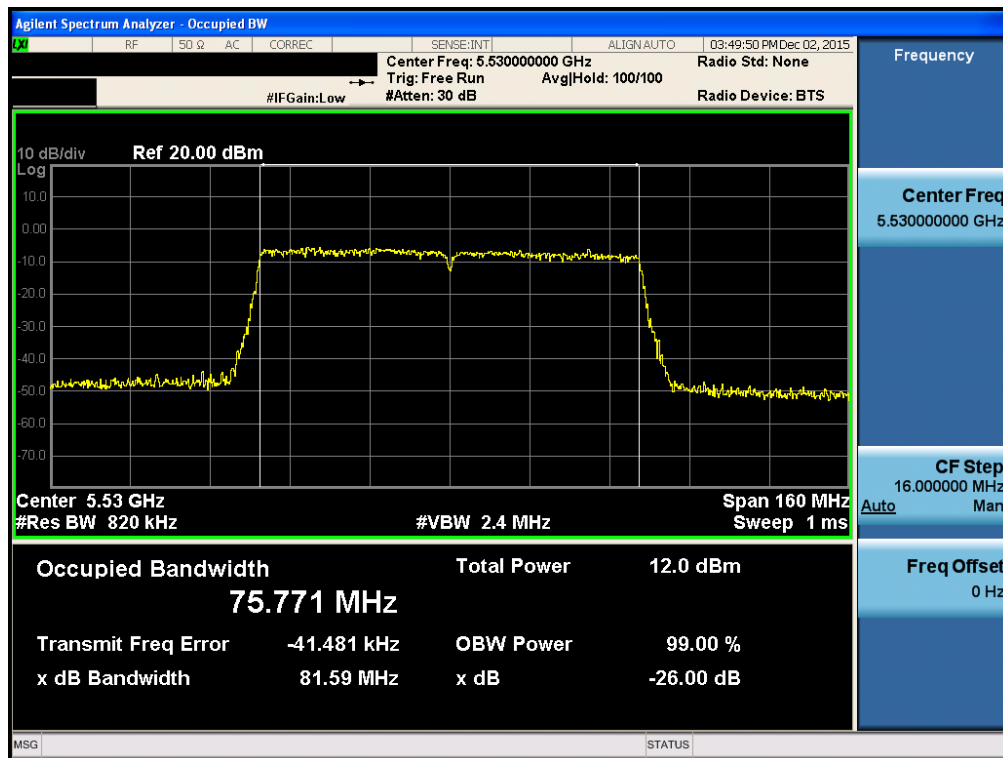
## 26 dB Bandwidth

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



## 26 dB Bandwidth

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



## 26 dB Bandwidth

Test Mode: 802.11a &amp; Ch.144



## 26 dB Bandwidth

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



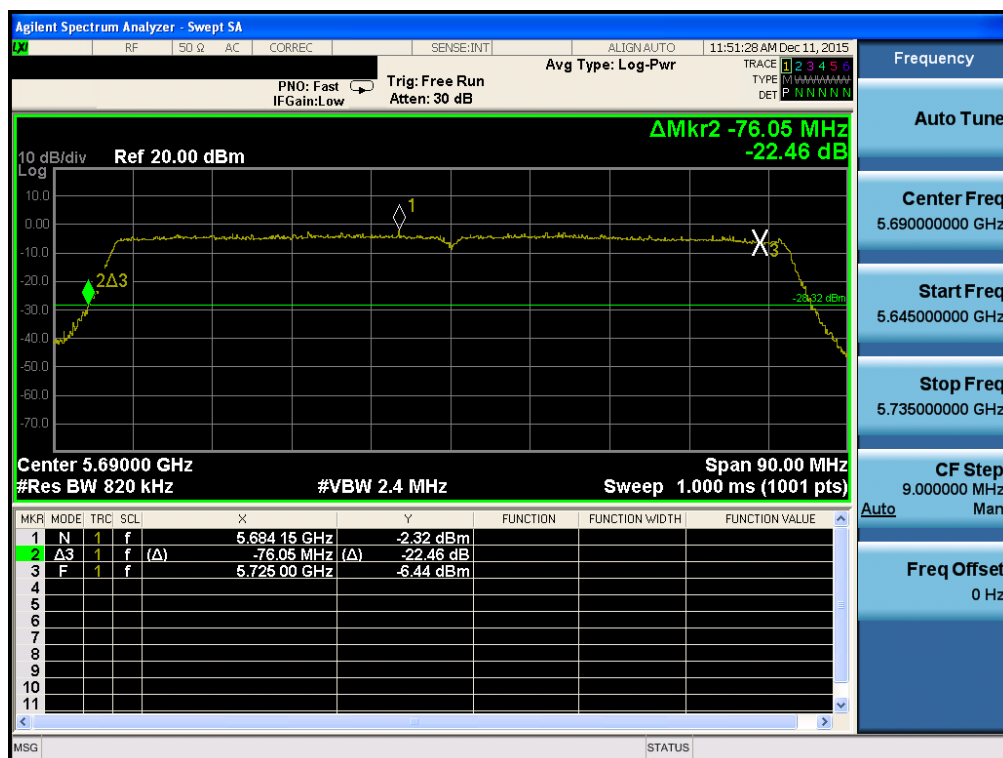
## 26 dB Bandwidth

Test Mode: 802.11n HT40 &amp; Ch.142



## 26 dB Bandwidth

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



## 8.2 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 V01**.

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**

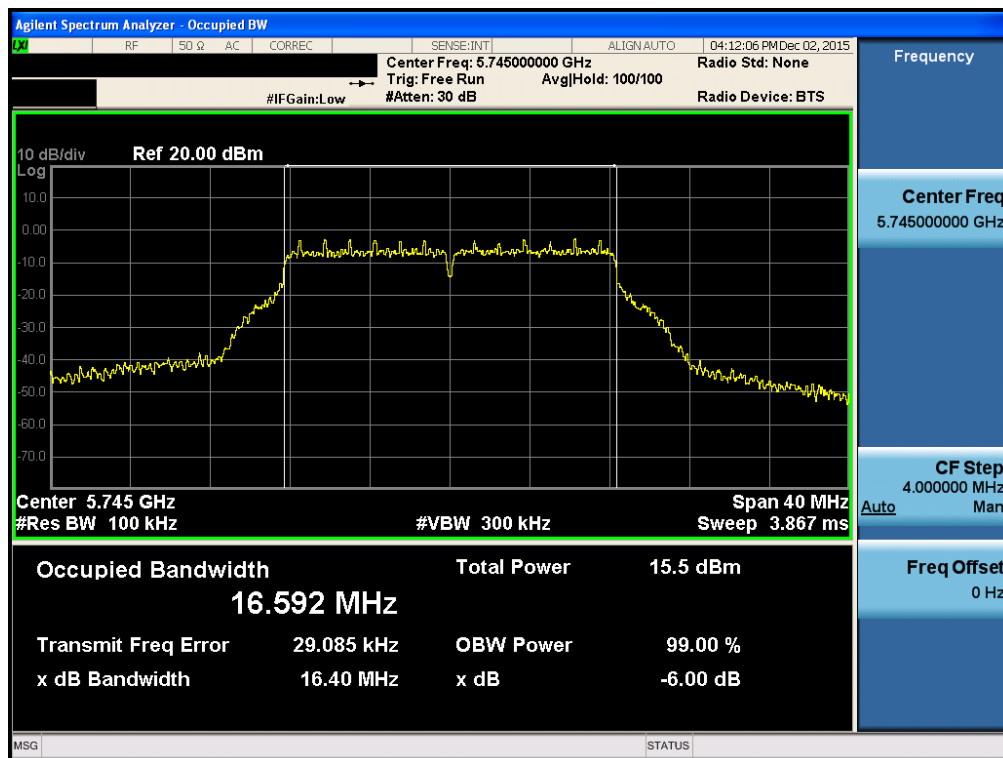
Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 3	149	5745	16.40
		157	5785	16.39
		165	5825	16.40
802.11n (HT20)	U-NII 3	149	5745	17.62
		157	5785	17.62
		165	5825	17.59
802.11n (HT40)	U-NII 3	151	5755	36.42
		159	5795	36.40
802.11ac (VHT80)	U-NII 3	155	5775	75.44
802.11a	Cross Band	144	5720	3.20
802.11n (HT20)	Cross Band	144	5720	3.83
802.11n (HT40)	Cross Band	142	5710	3.20
802.11ac (VHT80)	Cross Band	138	5690	2.70



## ■ RESULT PLOTS

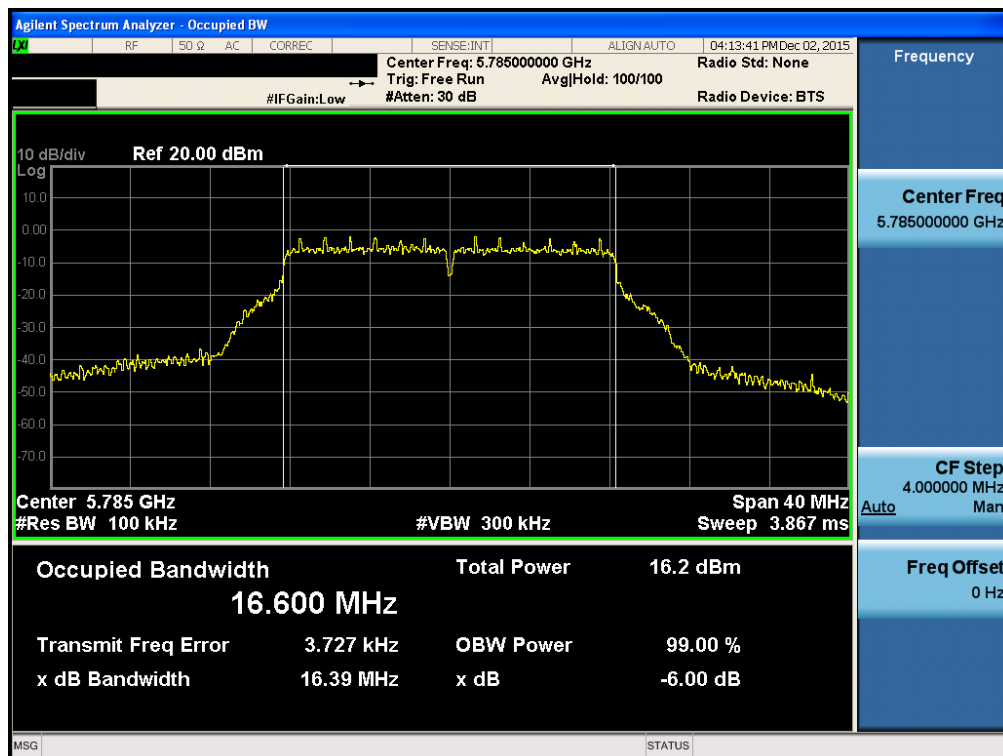
## 6 dB Bandwidth

Test Mode: 802.11a &amp; Ch.149



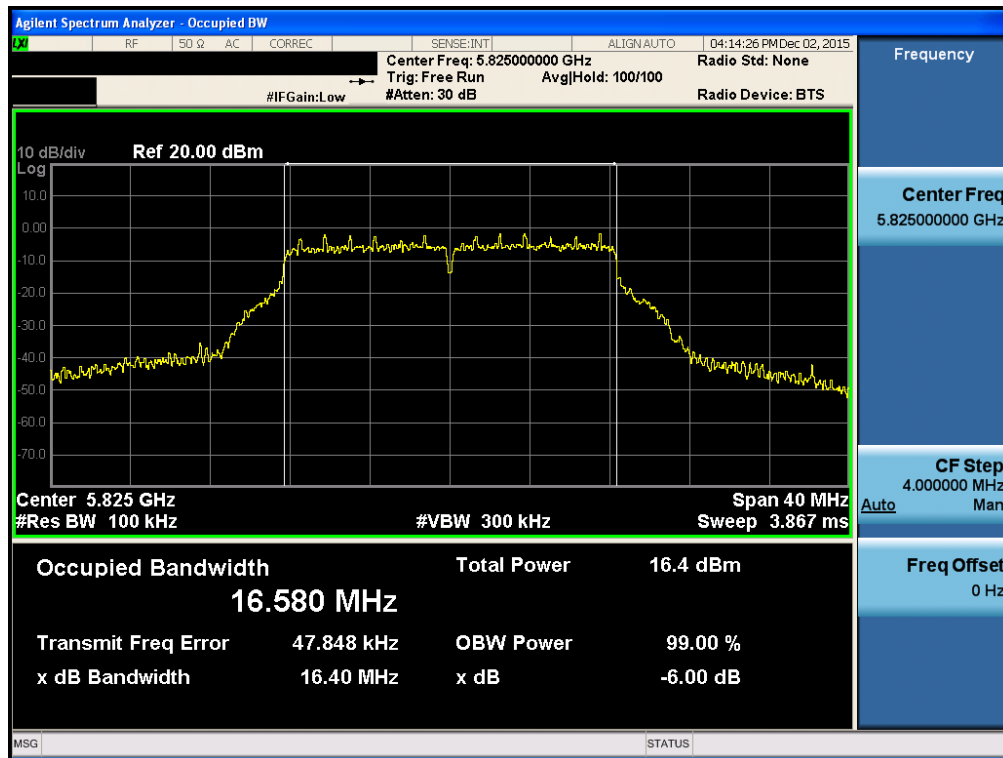
## 6 dB Bandwidth

Test Mode: 802.11a &amp; Ch.157



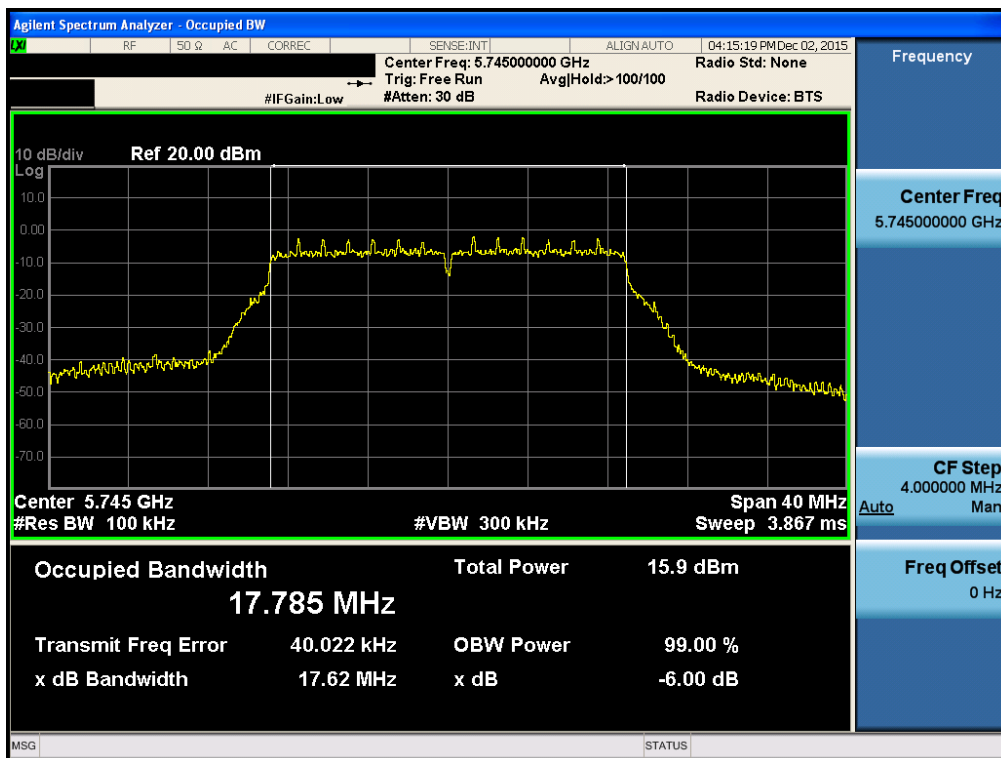
## 6 dB Bandwidth

Test Mode: 802.11a &amp; Ch.165



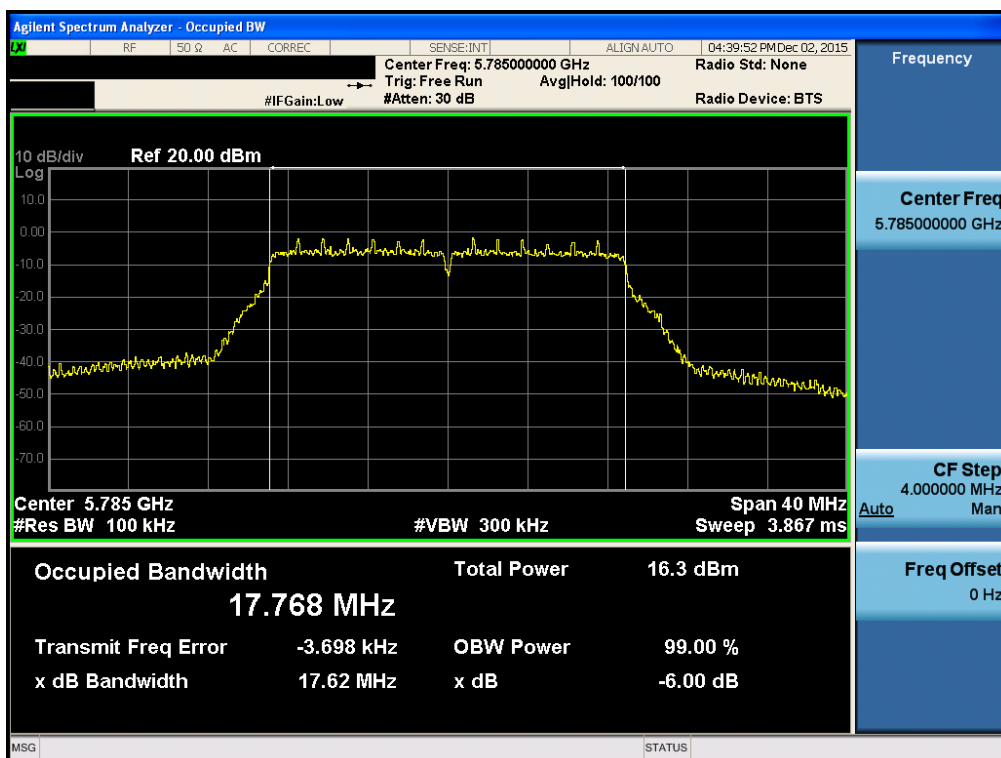
## 6 dB Bandwidth

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



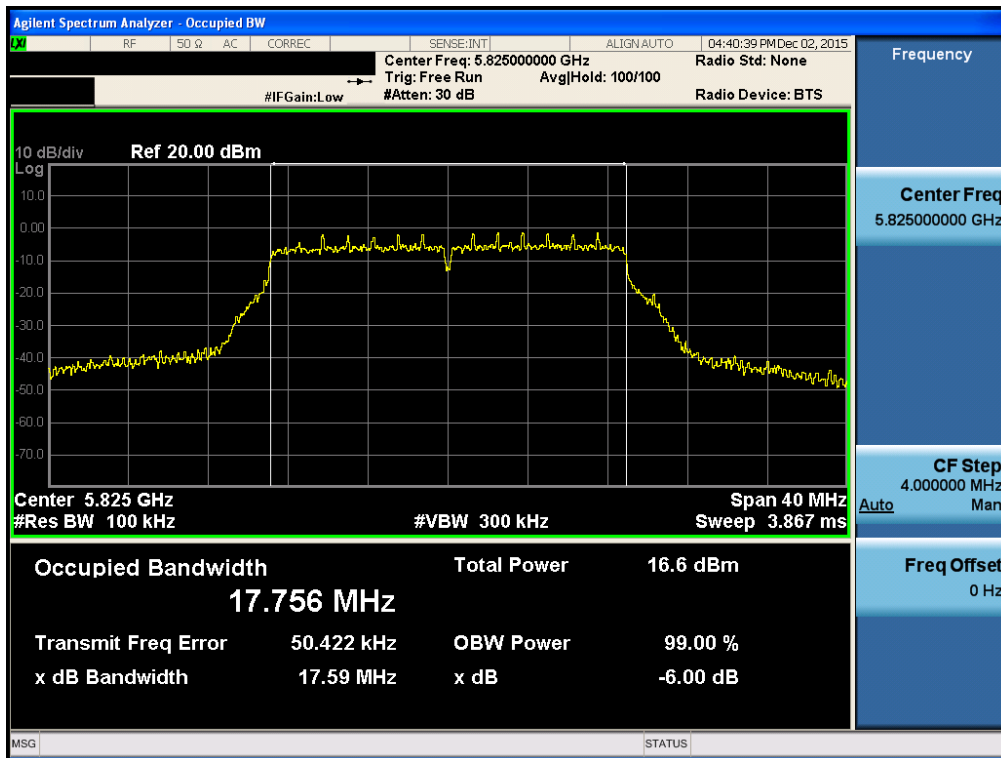
## 6 dB Bandwidth

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



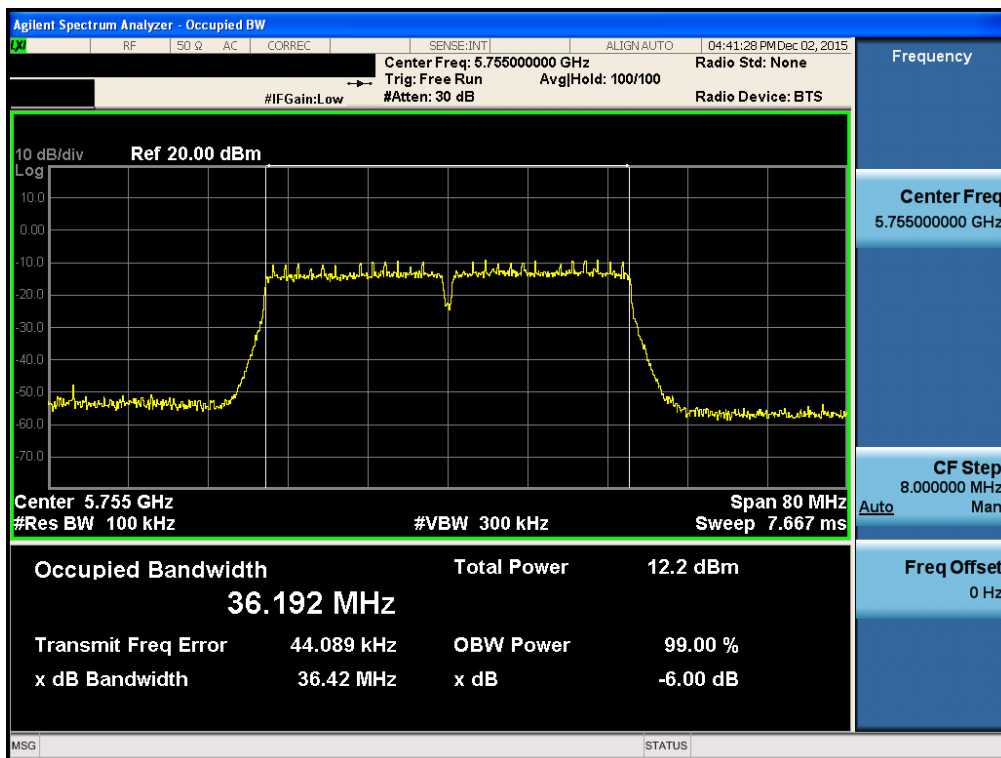
## 6 dB Bandwidth

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



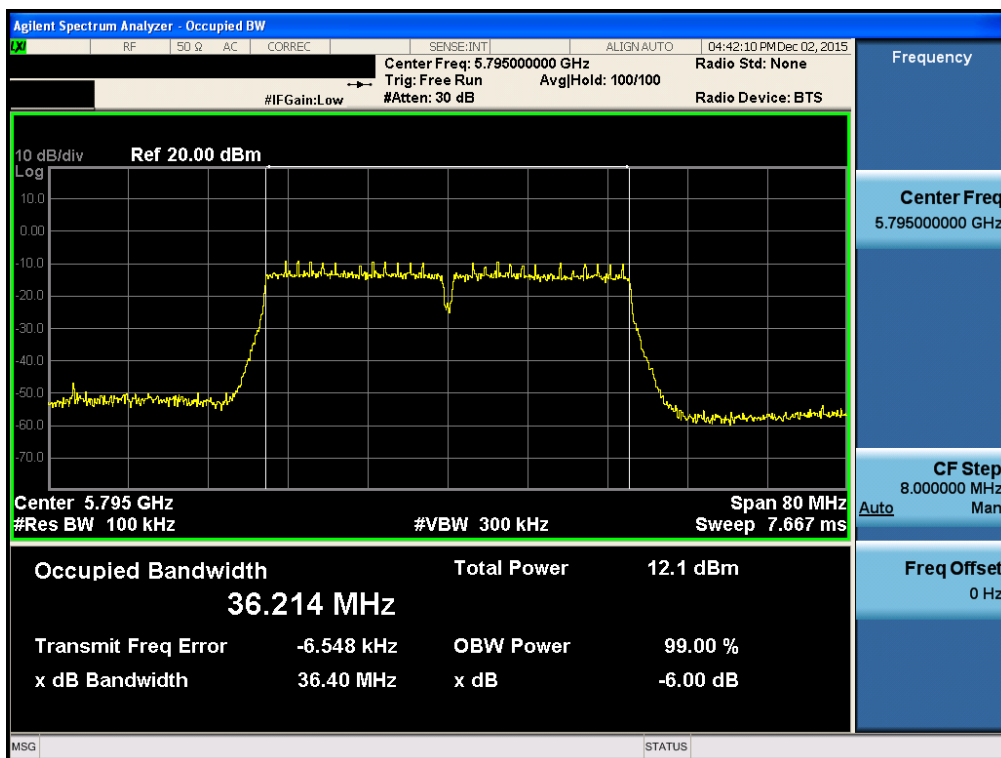
## 6 dB Bandwidth

Test Mode: 802.11n(HT40) &amp; Ch.151



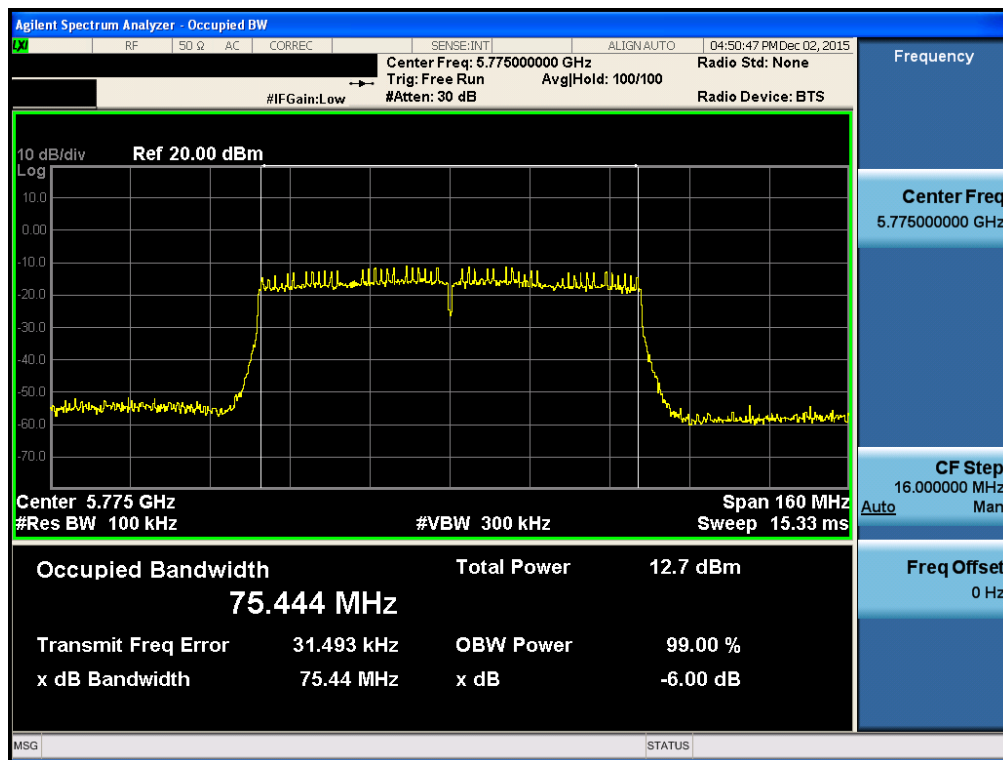
## 6 dB Bandwidth

Test Mode: 802.11n(HT40) &amp; Ch.159



## 6 dB Bandwidth

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



## 6 dB Bandwidth

Test Mode: 802.11a &amp; Ch.144



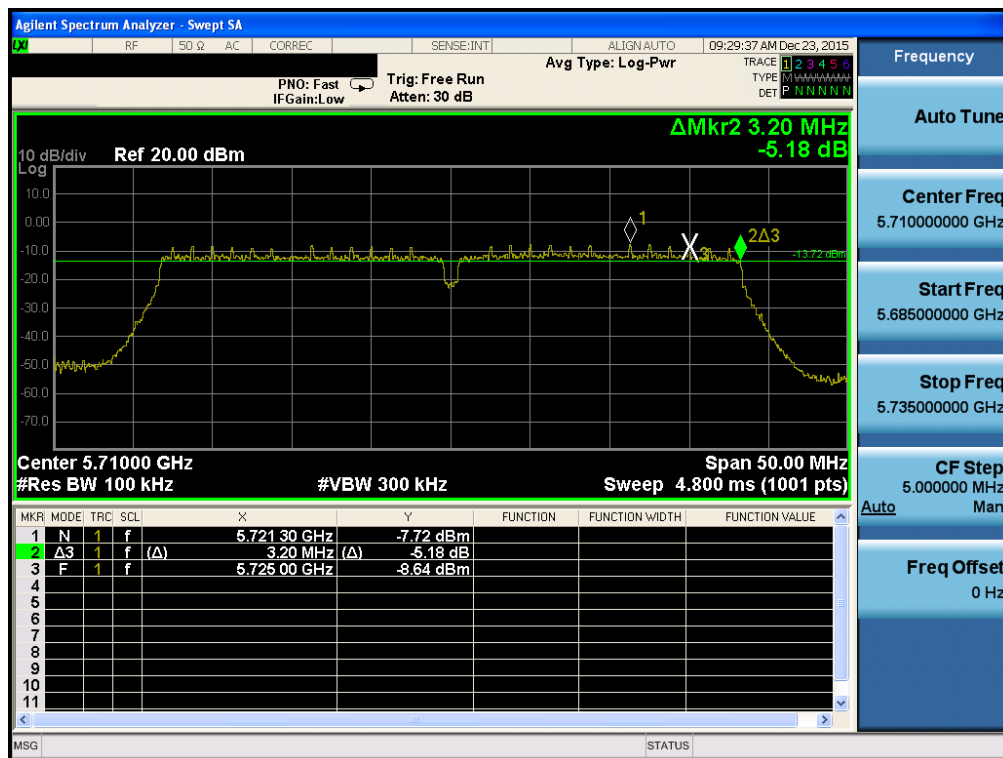
## 6 dB Bandwidth

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



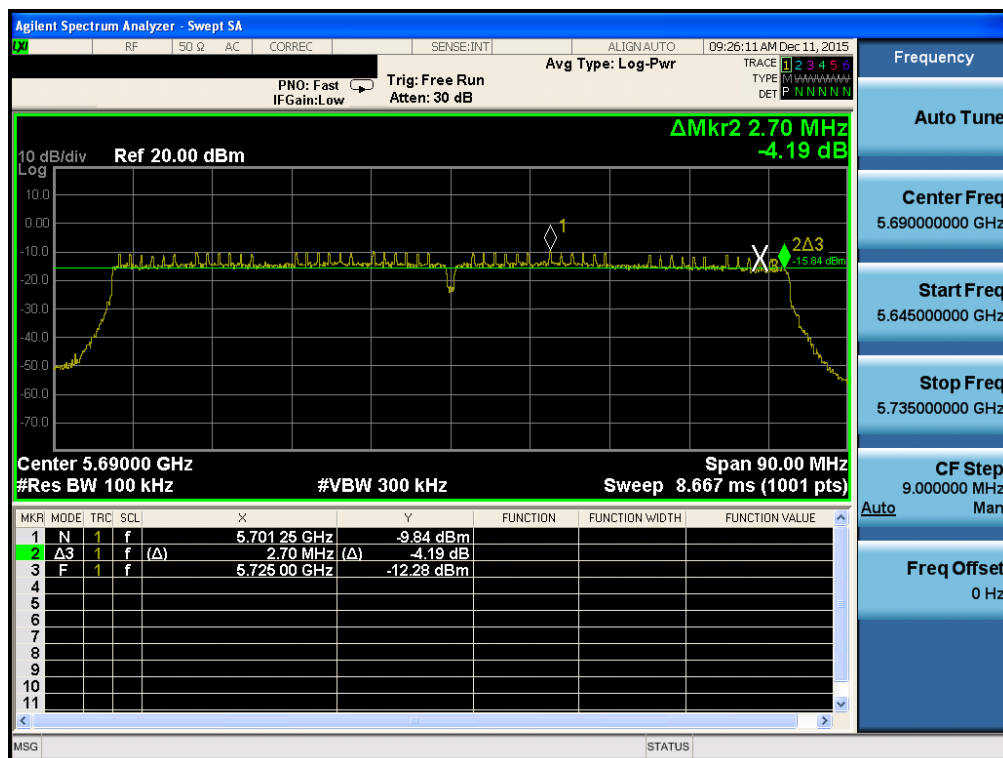
## 6 dB Bandwidth

Test Mode: 802.11n(HT40) &amp; Ch.142



## 6 dB Bandwidth

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





## 8.3 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, the maximum conducted output power 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, the maximum conducted output power 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. 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 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, the maximum conducted output power 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, the maximum conducted output power 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, the maximum conducted output power 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 (Worst case)	Determined Limit [dBm]
U-NII 1	802.11a	250	23.97	2.890	23.97
	802.11n(HT20)				
	802.11n(HT40)				
	802.11ac(VHT80)				

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2A	802.11a	250	23.97	2.890	23.97
		21.160	24.25		
	802.11n(HT20)	250	23.97		
		21.190	24.26		
	802.11n(HT40)	250	23.97		
		39.670	26.98		
	802.11ac(VHT80)	250	23.97		
		81.120	30.09		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2C	802.11a	250	23.97	2.510	23.97
		21.330	24.28		
	802.11n(HT20)	250	23.97		
		21.210	24.26		
	802.11n(HT40)	250	23.97		
		39.830	27.00		
	802.11ac(VHT80)	250	23.97		
		81.590	30.11		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2C (band-crossing channels)	802.11a	250	23.97	2.510	22.95
		15.690	22.95		
	802.11n(HT20)	250	23.97		22.98
		15.780	22.98		
	802.11n(HT40)	250	23.97		23.97
		35.150	26.45		
	802.11ac(VHT80)	250	23.97		23.97
		76.050	29.81		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
U-NII 3	802.11a	1000	30.00	5.780	30.00
	802.11n(HT20)				
	802.11n(HT40)				
	802.11ac(VHT80)				

**RSS-247[6.11]****(1) For band 5150 - 5250 MHz**

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99 % emission bandwidth in MHz.

**(2) For band 5250 - 5350 MHz**

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever power is less.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99 % emission bandwidth in MHz.

**(3) For band 5470 - 5600 MHz and 5650 - 5725 MHz**

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever power is less.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99 % emission bandwidth in MHz.

**(4) For band 5725 - 5850 MHz**

The maximum conducted output power shall not exceed 1 W.

**- Output power Limit Calculation(IC)**

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 99% BW [MHz]			
U-NII 1	802.11a	200	23.01	2.890	23.97
		17.022	22.31		
	802.11n(HT20)	200	23.01		
		17.060	22.31		
	802.11n(HT40)	200	23.01		
		36.278	25.59		
	802.11ac(VHT80)	200	23.01		
		75.844	28.79		

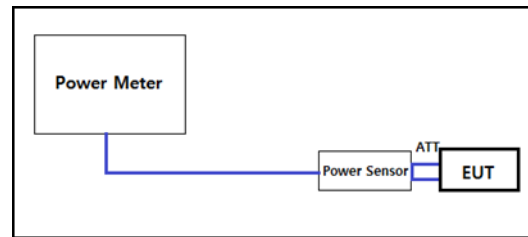
Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2A	802.11a	250	23.97	2.890	23.97
		16.975	23.29		
	802.11n(HT20)	250	23.97		
		18.033	23.56		
	802.11n(HT40)	250	23.97		
		36.424	26.61		
	802.11ac(VHT80)	250	23.97		
		75.840	29.79		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2C	802.11a	250	23.97	2.510	23.97
		17.074	23.32		
	802.11n(HT20)	250	23.97		
		18.085	23.57		
	802.11n(HT40)	250	23.97		
		36.356	26.60		
	802.11ac(VHT80)	250	23.97		
		76.077	29.81		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW [MHz]			
U-NII 2C (band-crossing channels)	802.11a	250	23.97	2.510	22.95
		17.043	23.31		
	802.11n(HT20)	250	23.97		22.98
		18.014	23.55		
	802.11n(HT40)	250	23.97		23.97
		36.403	26.61		
	802.11ac(VHT80)	250	23.97		23.97
		75.952	29.80		

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
U-NII 3	802.11a	1000	30.00	5.780	30.00
	802.11n(HT20)				
	802.11n(HT40)				
	802.11ac(VHT80)				

## ■ Test Configuration



## ■ Test Procedure

Maximum Conducted Output Power is measured using Measurement Procedure **Method PM - G of KDB789033 D02 V01**

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	13.23
		40	5200	13.03
		48	5240	13.07
	U-NII 2A	52	5260	12.77
		60	5300	12.61
		64	5320	12.69
	U-NII 2C	100	5500	11.47
		116	5580	11.43
		140	5700	12.87
	U-NII 3	149	5745	11.23
		157	5785	11.62
		165	5825	11.37
802.11n HT20	U-NII 1	36	5180	13.15
		40	5200	13.09
		48	5240	12.91
	U-NII 2A	52	5260	12.72
		60	5300	12.50
		64	5320	12.59
	U-NII 2C	100	5500	11.18
		116	5580	11.53
		140	5700	13.04
	U-NII 3	149	5745	11.06
		157	5785	11.88
		165	5825	11.85
802.11n HT40	U-NII 1	38	5190	7.96
		46	5230	7.73
	U-NII 2A	54	5270	9.65
		62	5310	9.58
	U-NII 2C	102	5510	7.22
		110	5550	6.97
	U-NII 3	134	5670	7.85
		151	5755	7.09
802.11ac VHT80	U-NII 1	159	5795	7.70
		-	-	-
	U-NII 2A	42	5210	8.26
		58	5290	9.81
	U-NII 2C	-	-	-
		106	5530	7.23
	U-NII 3	-	-	-
		155	5755	7.76

Mode		Channel	Frequency [MHz]	Reading [dBm]	D.C.F [dB] Note 1	Test Result [dBm]
802.11a	U-NII 2C	144	5720	9.90	0.32	10.22
	U-NII 3	144	5720	3.35		3.67
802.11n HT20	U-NII 2C	144	5720	9.60	0.37	9.97
	U-NII 3	144	5720	3.48		3.85
802.11n HT40	U-NII 2C	142	5710	5.17	0.66	5.83
	U-NII 3	142	5710	-5.29		-4.63
802.11ac VHT80	U-NII 2C	138	5690	5.03	1.20	6.23
	U-NII 3	138	5690	-10.04		-8.84

Note 1: D.C.F =  $10 \log(1/x)$  where x is the duty cycle.

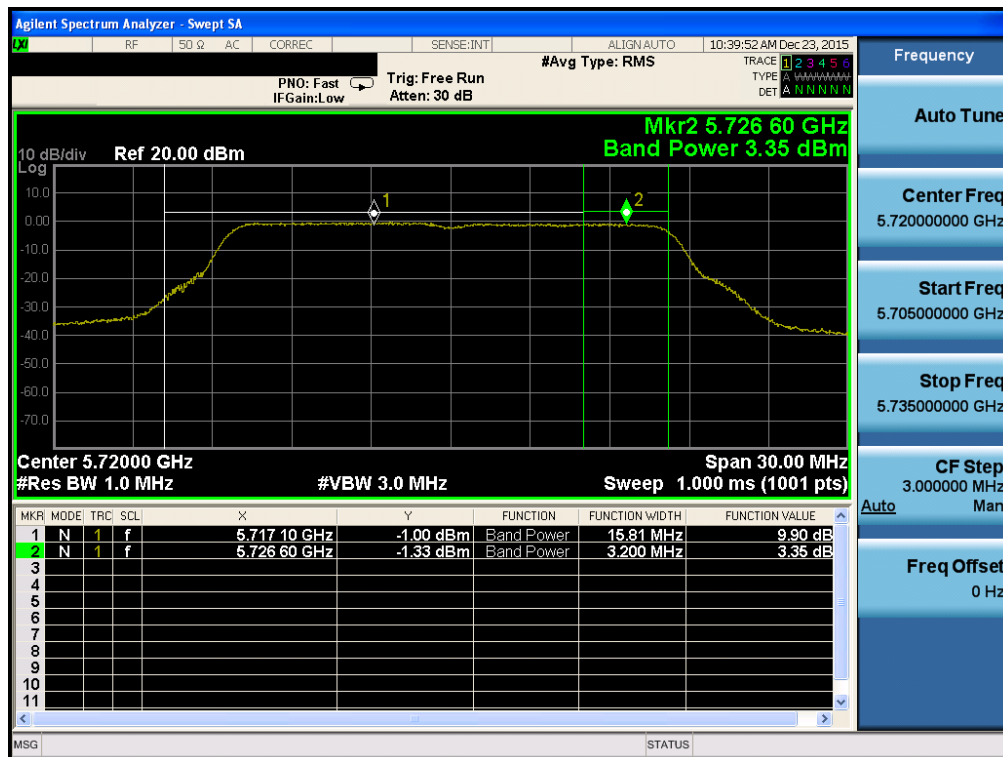
Note 2: Test Result = Measurement Data + D.C.F



## ■ RESULT PLOTS

## Maximum Output Power

Test Mode: 802.11a &amp; Ch.144



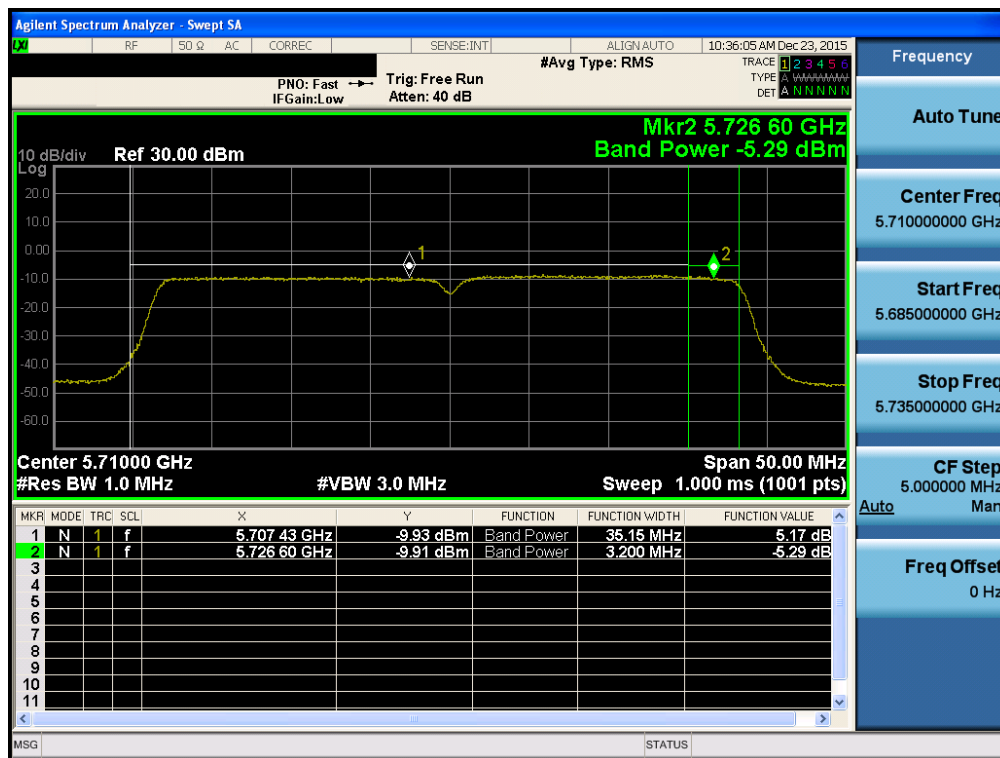
## Maximum Output Power

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



## Maximum Output Power

Test Mode: 802.11n HT40 &amp; Ch.142



## Maximum Output Power

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

