

RF TEST REPORT

Test item : Wi-Fi Transmitter
Model No. : WEH720B
Order No. : DTNC1412-05482
Date of receipt : 2014-12-10
Test duration : 2014-12-15 ~ 2014-12-31
Date of issue : 2015-01-20
Use of report : FCC Original Grant

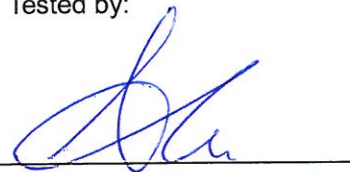
Applicant : Samsung Electronics Co., Ltd.
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Test laboratory : DT&C Co., Ltd.
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Test specification : FCC Part 15.407 Subpart E
Test environment : See appended test report
Test result : ☒ Pass ☐ Fail

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.

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Test Report Version

Test Report No.	Date	Description
DRTFCC1501-0009	Jan. 20, 2014	Initial issue

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1. EUT DESCRIPTION

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
Product	Wi-Fi Transmitter
Model Name	WEH720B
Add Model Name	NA
Power Supply	DC 5 V
Frequency Range	U-NII 1(5150 ~ 5250MHz) ▪ 802.11a/n/ac(HT20, VHT20): 5180 ~ 5240 MHz ▪ 802.11n/ac(HT40, VHT40): 5190 ~ 5230 MHz ▪ 802.11ac(VHT80): 5210 MHz U-NII 2A(5250 ~ 5350MHz) ▪ 802.11a/n/ac(HT20, VHT40): 5260 ~ 5320 MHz ▪ 802.11n/ac(HT40, VHT40): 5270 ~ 5310 MHz ▪ 802.11ac(VHT80): 5290 MHz U-NII 2C(5470 ~ 5725MHz) ▪ 802.11a/n/ac(HT20, VHT20): 5500 ~ 5700 MHz ▪ 802.11n/ac(HT40, VHT40): 5510 ~ 5670 MHz ▪ 802.11ac(VHT80): 5530 MHz U-NII 3(5725 ~ 5850MHz) ▪ 802.11a/n/ac(HT20, VHT20): 5745 ~ 5825 MHz ▪ 802.11n/ac(HT40, VHT40): 5755 ~ 5795 MHz ▪ 802.11ac(VHT80): 5775 MHz
Modulation type	256QAM, 64QAM, 16QAM, QPSK BPSK for OFDM
Antenna Specification	Antenna type: Internal Antenna Antenna gain ▪ U-NII 1 band: ANT 1: 2.500 dBi & ANT 2: 2.200 dBi ▪ U-NII 2A band: ANT 1: 2.600 dBi & ANT 2: 2.800 dBi ▪ U-NII 2C band: ANT 1: 2.800 dBi & ANT 2: 2.500 dBi ▪ U-NII 3 band: ANT 1: 2.000 dBi & ANT 2: 2.800 dBi Antenna Configuration ▪ 802.11a: Single Transmitting (ANT 1) ▪ 802.11n(MCS0 ~ 7) : Single Transmitting (ANT 1 or ANT 2) ▪ 802.11n(MCS8 ~ 15) : Multiple Transmitting (ANT 1 and ANT 2) ▪ 802.11ac(NSS1 MCS0 ~ 9) : Single Transmitting (ANT 1 or ANT 2) ▪ 802.11ac(NSS2 MCS0 ~ 9) : Multiple Transmitting (ANT 1 and ANT 2)

Note: This device does not used TDWR band.

2. Information about test items

2.1 Test mode / Channel Information

5GHz Band	Mode	Data Rate	
		Single transmitting	Multiple transmitting
U-NII 1	802.11a	6Mbps	NA
	802.11n(HT20)	MCS 0	MCS 8
	802.11n(HT40)	MCS 0	MCS 8
	802.11ac(VHT20)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT40)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0	NSS2 MCS 0
U-NII 2A	802.11a	6Mbps	NA
	802.11n(HT20)	MCS 0	MCS 8
	802.11n(HT40)	MCS 0	MCS 8
	802.11ac(VHT20)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT40)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0	NSS2 MCS 0
U-NII 2C	802.11a	6Mbps	NA
	802.11n(HT20)	MCS 0	MCS 8
	802.11n(HT40)	MCS 0	MCS 8
	802.11ac(VHT20)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT40)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0	NSS2 MCS 0
U-NII 3	802.11a	6Mbps	NA
	802.11n(HT20)	MCS 0	MCS 8
	802.11n(HT40)	MCS 0	MCS 8
	802.11ac(VHT20)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT40)	NSS1 MCS 0	NSS2 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0	NSS2 MCS 0

The worst case data rate for each modulation is determined as above table. And all tests conducted in this report were made at the worst case data rate of each modulation.

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	-	-

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Notebook PC	20095	WB06116969	Lenovo	DOC

2.4 Tested environment

Temperature	: 21 °C ~ 24 °C
Relative humidity content	: 41 % ~ 45 % R.H.
Details of power supply	: DC 5 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)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)				
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 For FCC: < 30 dBm or < 23.97 dBm 5150 ~ 5250MHz For IC: 200mW or <10 + 10log ₁₀ (B) dBm, whichever power is less. 5250 ~ 5350MHz & 5470 ~ 5725MHz For FCC & IC 250mW or <11 + 10log ₁₀ (B) dBm, whichever power is less. 5725 ~ 5850MHz For FCC: < 30 dBm		C Note 3
15.407(a)	Peak Power Spectral Density	5150 ~ 5250MHz For FCC: 11dBm/MHz or 17dBm/MHz 5150 ~ 5250MHz For IC: 10dBm/MHz 5250 ~ 5350MHz & 5470 ~ 5725MHz For FCC & IC: 11dBm/MHz 5725 ~ 5850MHz For FCC: 30dBm/500kHz		C Note 4
15.407(g)	Frequency Stability	N/A		C
15.407(b)	Undesirable Emissions	5150 ~ 5725MHz: < -27 dBm/MHz EIRP 5725 ~ 5850MHz: < -17 dBm/MHz EIRP or < -27 dBm/MHz EIRP	Radiated	C Note 5, 6
15.205 15.209 15.407(b)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		C Note 6
15.407(h)	Dynamic Frequency Selection	See DFS test report	-	C Note 7
15.207	AC Conducted Emissions	FCC 15.207	AC Line Conducted	C
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, KDB662911 D01 v02r01 and ANSI C63.10-2009.

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

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB789033 D02 v01. And ANSI C63.10-2009 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 C63.10-2009.

The EUT is placed on the table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15MHz and 30MHz 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 C63.10-2009 as stated on KDB789033 D02 v01.

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 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: 678747

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, bi-log, 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

7.1 According to FCC 47 CFR §15.203 & RSS-Gen [8.3]:

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 of this E.U.T is permanently attached on the main PCB.(Refer to Internal Photo.)
Therefore this module Complies with the requirement of §15.203**

7.2 Directional antenna gain(Worst case):

Bands	ANT 1 [dBi]	ANT 2 [dBi]	Directional Gain [dBi]
U-NII 1	2.500	2.200	5.362 ^{Note 1.}
U-NII 2A	2.600	2.800	5.711 ^{Note 1.}
U-NII 2C	2.800	2.500	5.662 ^{Note 1.}
U-NII 3	2.000	2.800	5.420 ^{Note 1.}

Note 1. Directional gain(correlated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N^{ANT}] \text{ dBi}$$

Note 2. Directional gain(completely uncorrelated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N^{ANT}] \text{ dBi}$$

Note 3. Directional gain(spatial multiplexing)

$$G_{ANT \text{ MAX}} + 10 \log (N_{ANT} / N_{SS}) \text{ dBi}$$

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 26dB 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%.

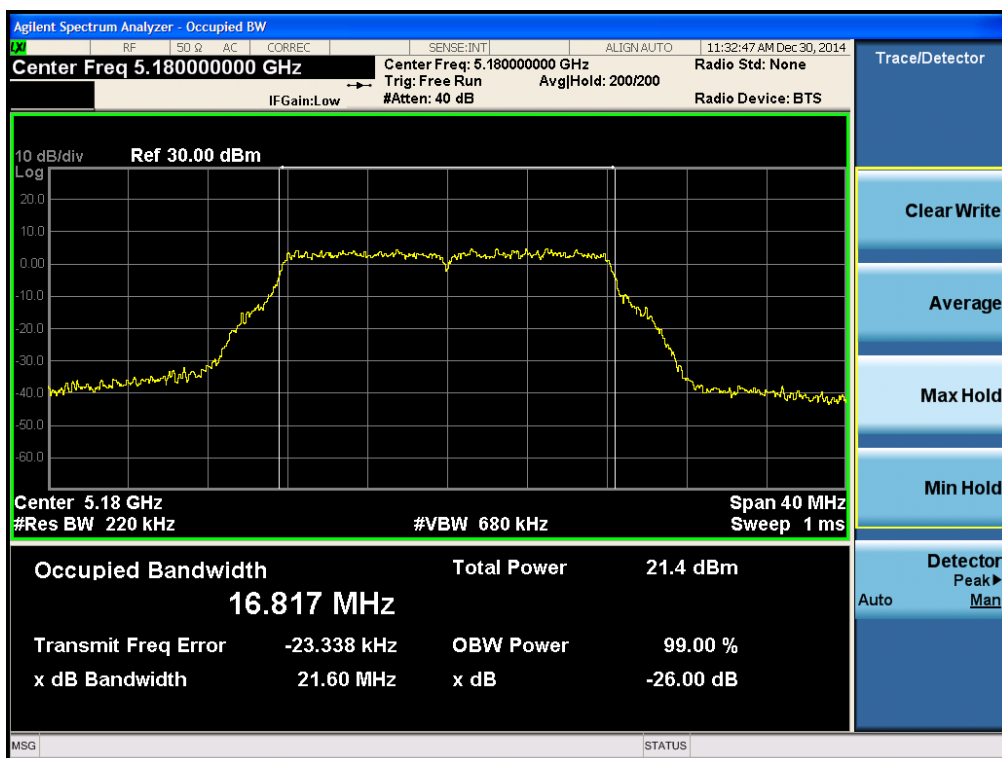
■ Test Results: **Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]	
				ANT 1	ANT 2
802.11a	U-NII 1	36	5180	21.600	-
		40	5200	21.510	-
		48	5240	21.520	-
	U-NII 2A	52	5260	21.660	-
		60	5300	21.660	-
		64	5320	21.430	-
	U-NII 2C	100	5500	21.500	-
		116	5580	21.550	-
		140	5700	21.590	-
802.11n (HT20)	U-NII 1	36	5180	21.800	21.670
		40	5200	21.770	21.780
		48	5240	21.810	21.720
	U-NII 2A	52	5260	21.610	21.670
		60	5300	21.670	21.820
		64	5320	21.730	21.620
	U-NII 2C	100	5500	21.770	21.710
		116	5580	21.660	21.870
		140	5700	21.680	21.730
802.11n (HT40)	U-NII 1	38	5190	40.030	39.850
		46	5230	40.380	39.840
	U-NII 2A	54	5270	39.990	39.930
		62	5310	39.680	39.990
	U-NII 2C	102	5510	39.940	40.060
		110	5550	40.000	40.000
802.11ac (VHT80)	U-NII 1	134	5670	40.160	40.190
	U-NII 1	42	5210	81.860	81.850
	U-NII 2A	58	5290	81.420	81.510
	U-NII 2C	106	5530	81.860	81.810

■ Result Plots

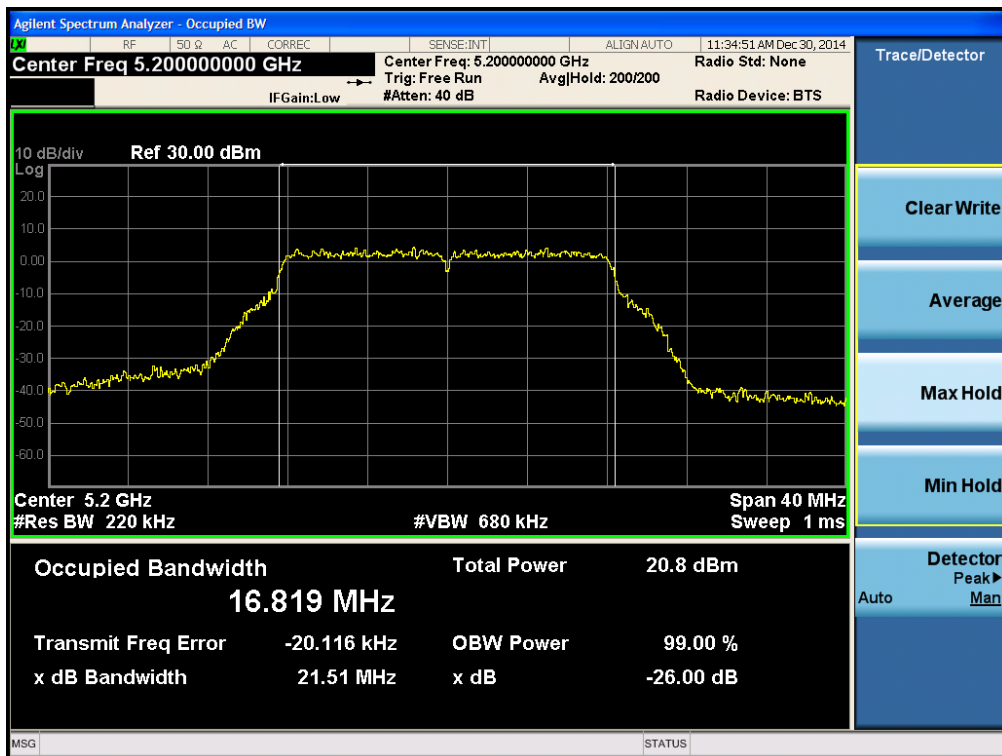
26 dB Bandwidth

Test Mode: 802.11a & Ch.36 & ANT 1



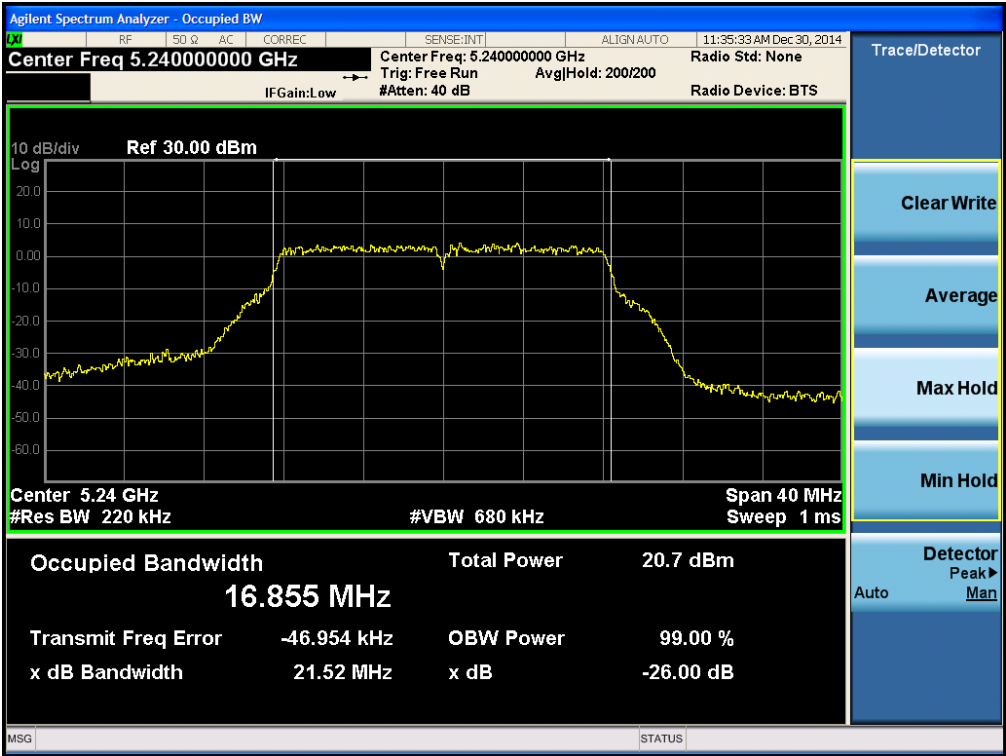
26 dB Bandwidth

Test Mode: 802.11a & Ch.40 & ANT 1



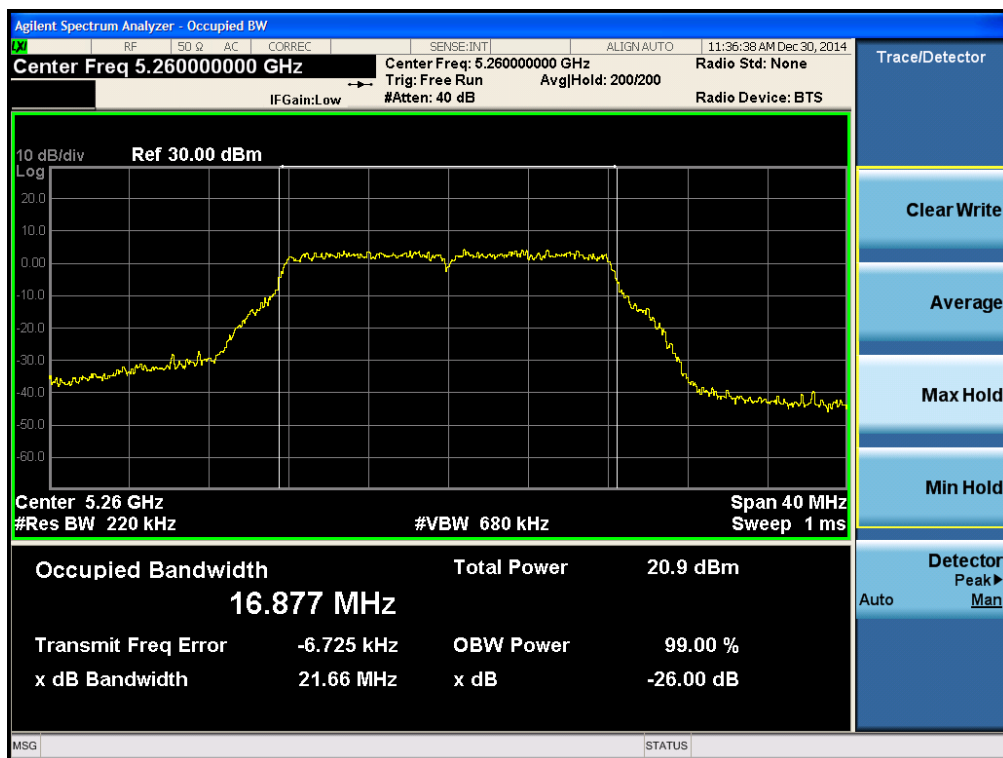
26 dB Bandwidth

Test Mode: 802.11a & Ch.48 & ANT 1



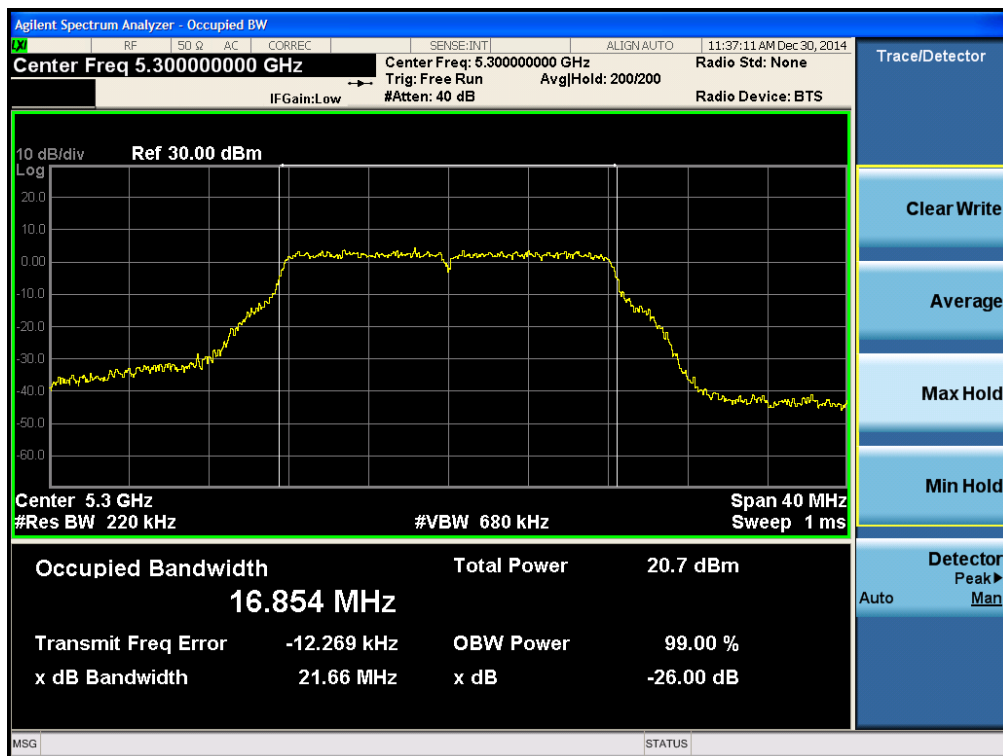
26 dB Bandwidth

Test Mode: 802.11a & Ch.52 & ANT 1



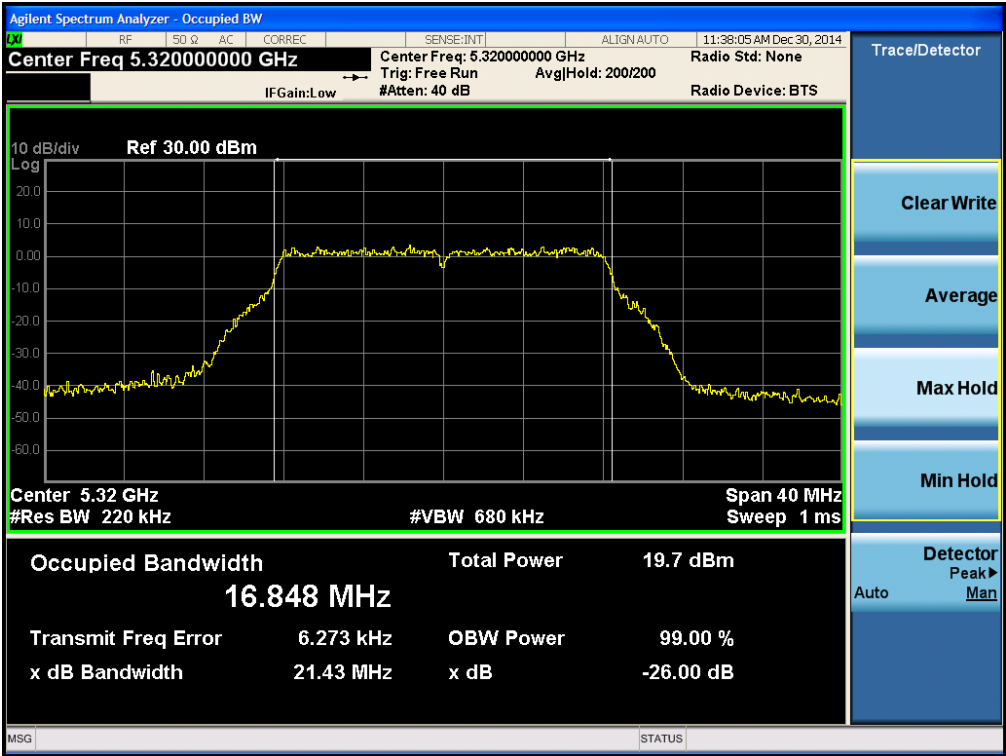
26 dB Bandwidth

Test Mode: 802.11a & Ch.60 & ANT 1



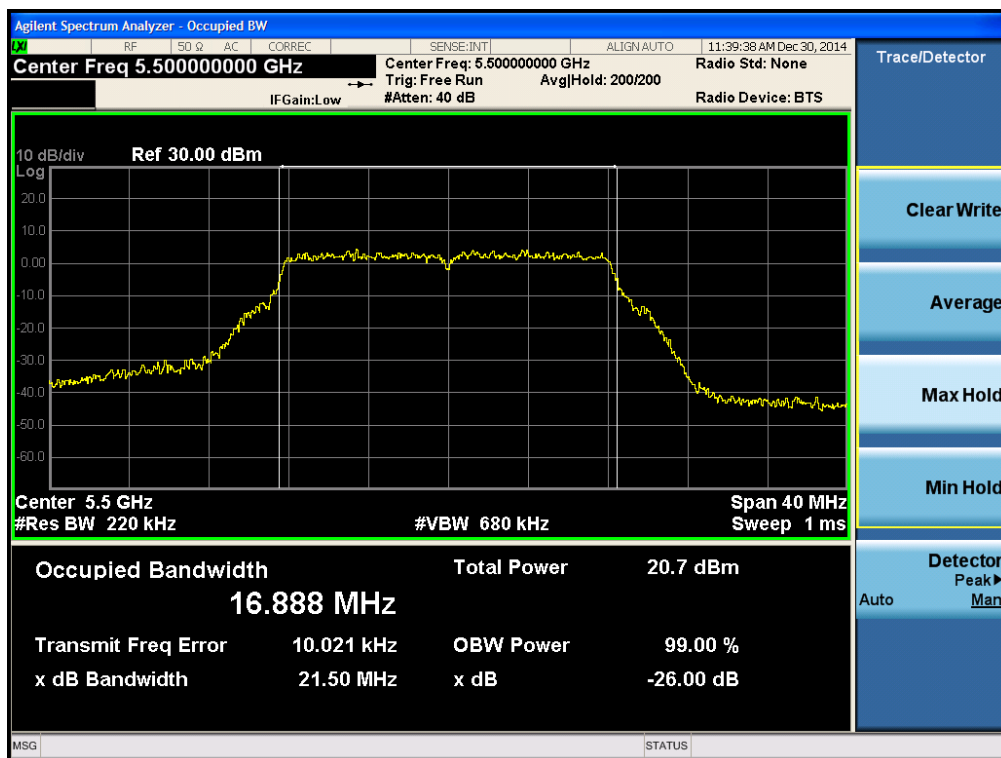
26 dB Bandwidth

Test Mode: 802.11a & Ch.64 & ANT 1



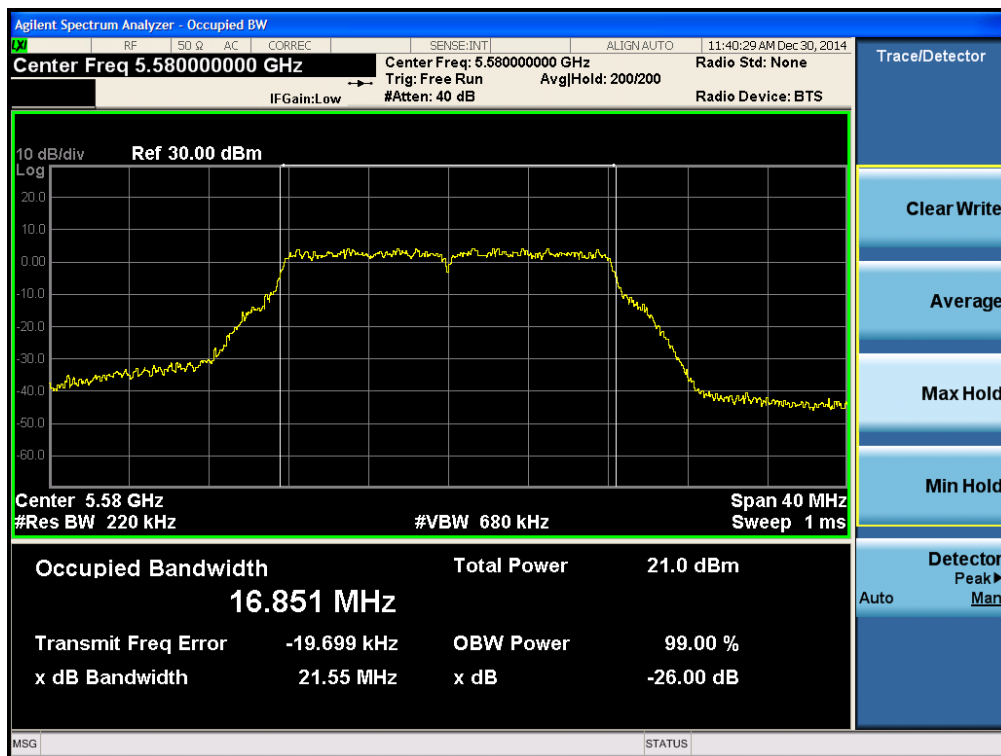
26 dB Bandwidth

Test Mode: 802.11a & Ch.100 & ANT 1



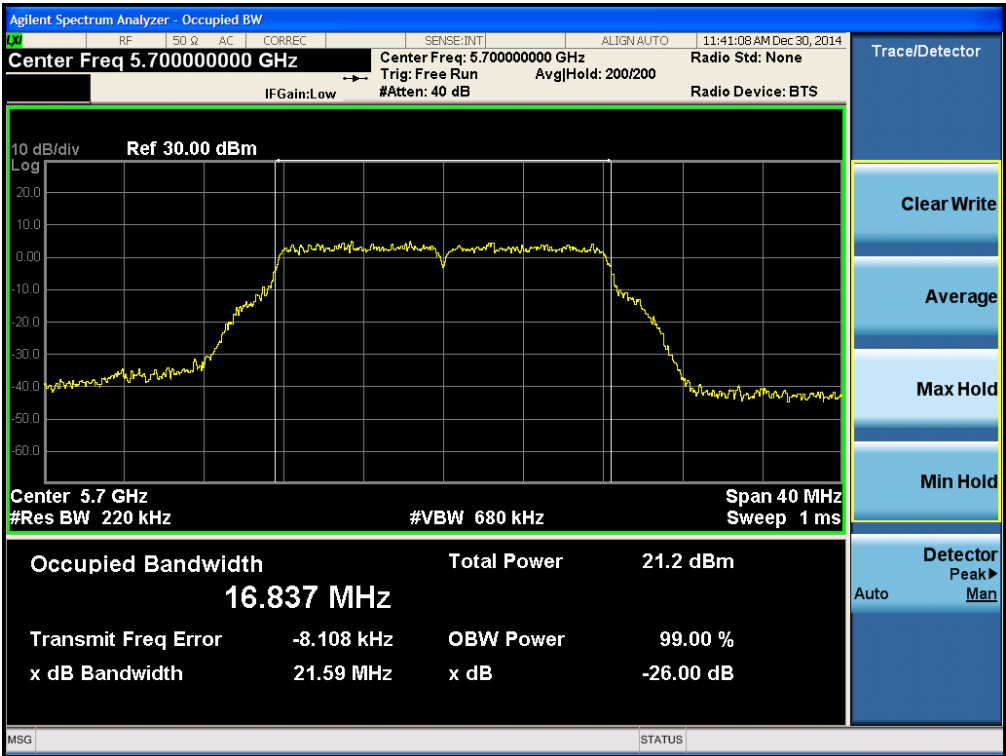
26 dB Bandwidth

Test Mode: 802.11a & Ch.116 & ANT 1



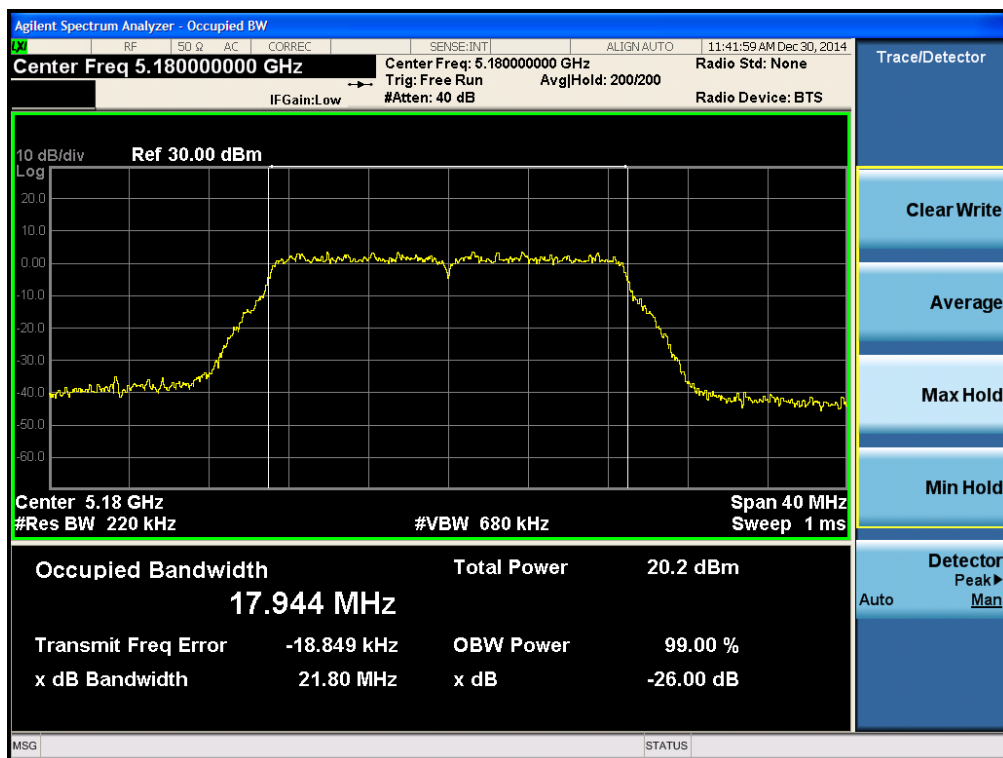
26 dB Bandwidth

Test Mode: 802.11a & Ch.140 & ANT 1



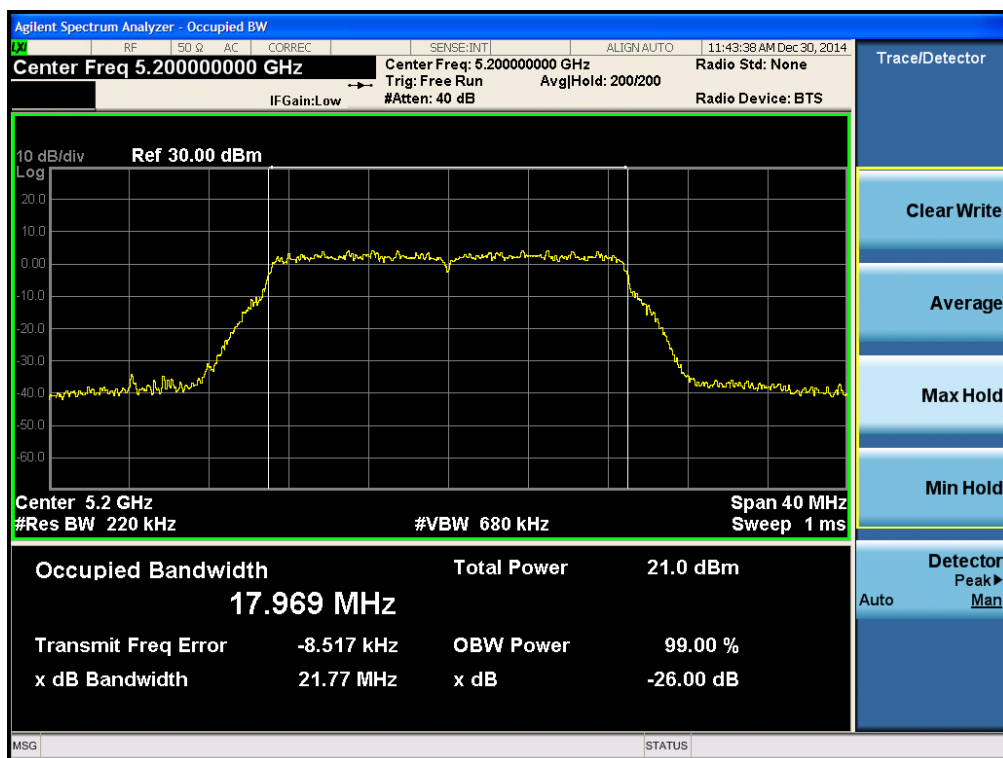
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.36 & ANT 1



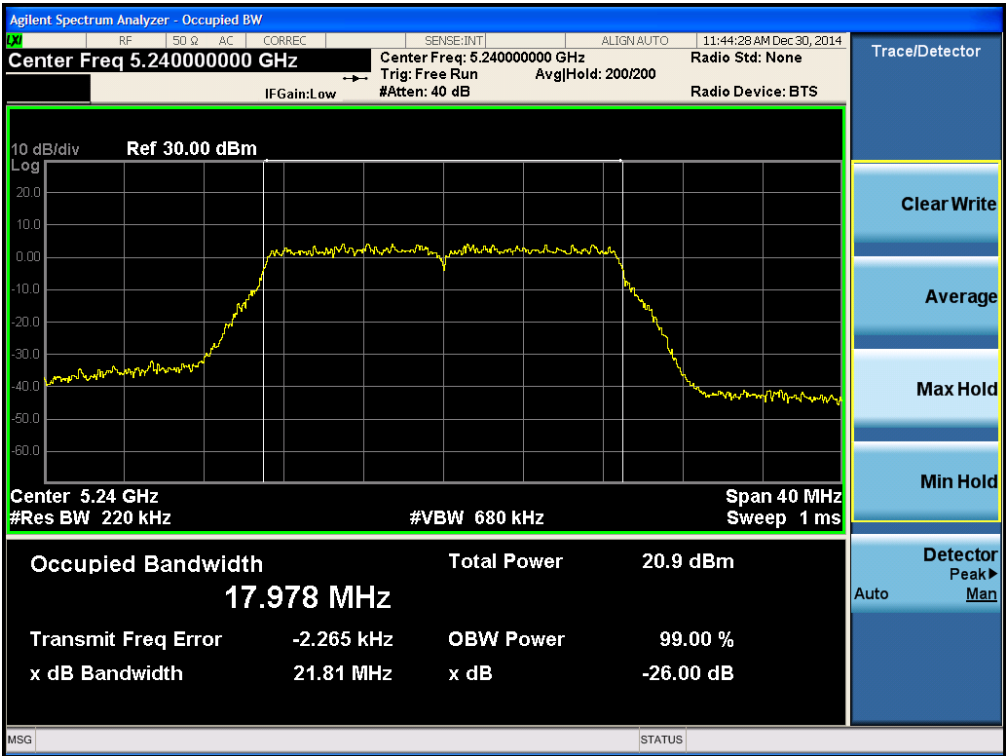
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.40 & ANT 1



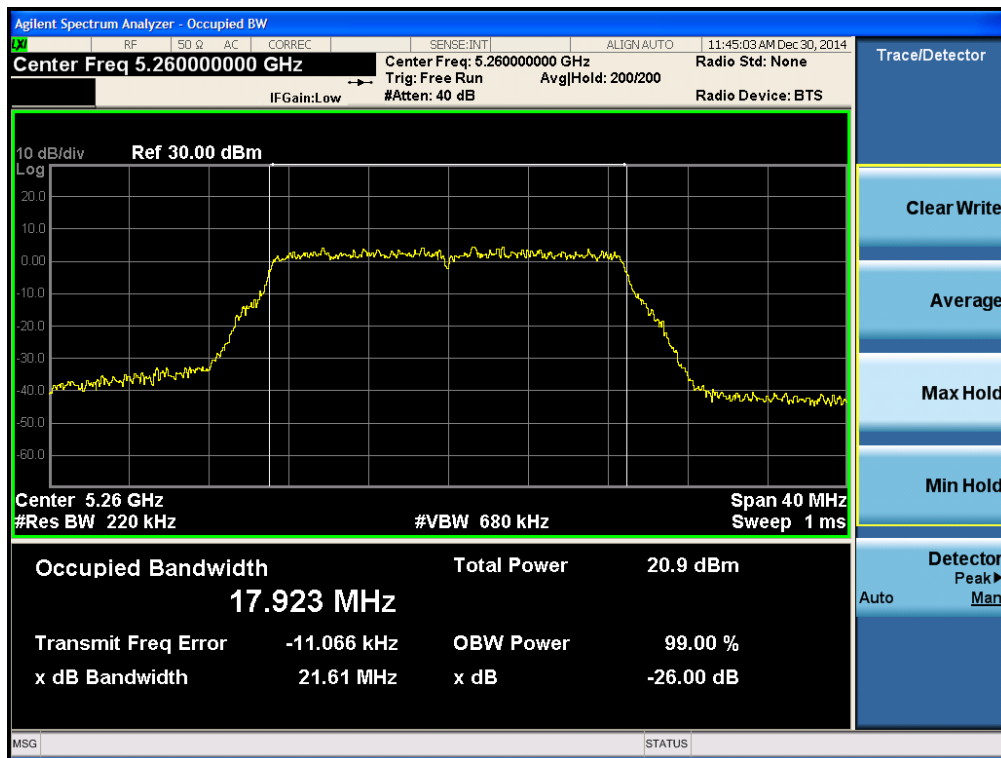
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.48 & ANT 1



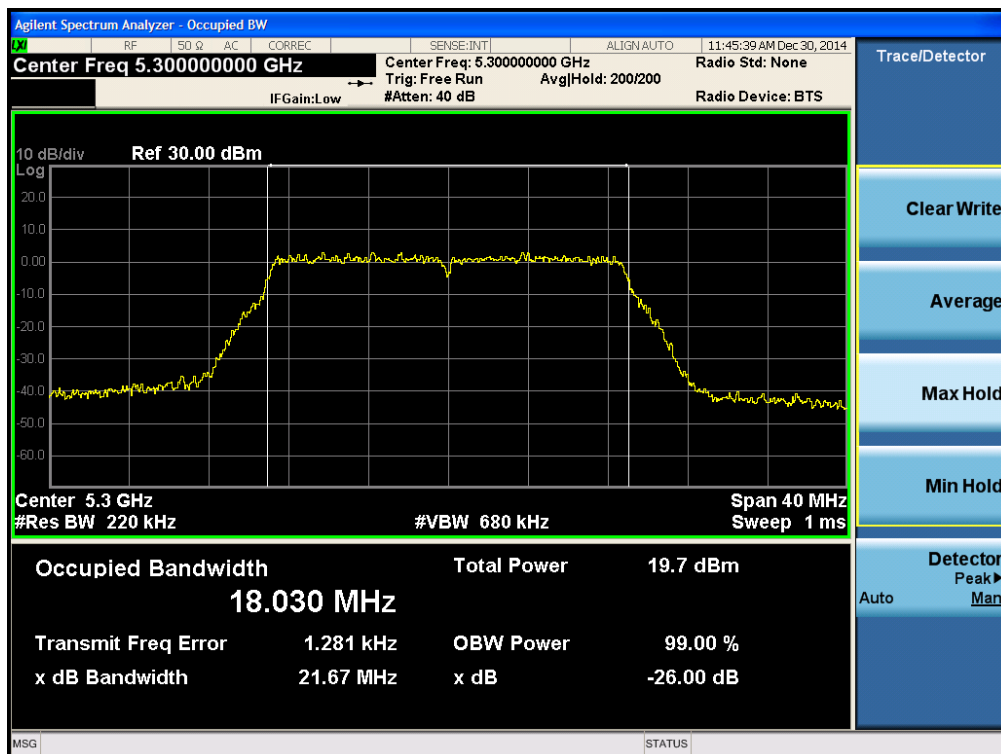
26 dB Bandwidth

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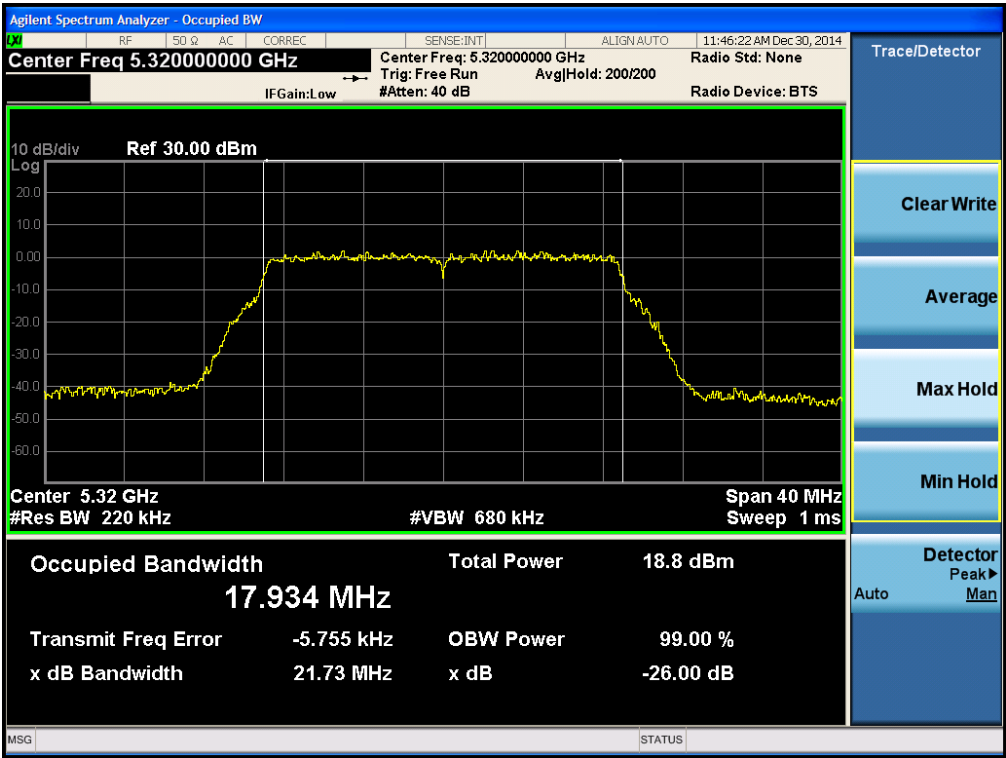
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.60 & ANT 1



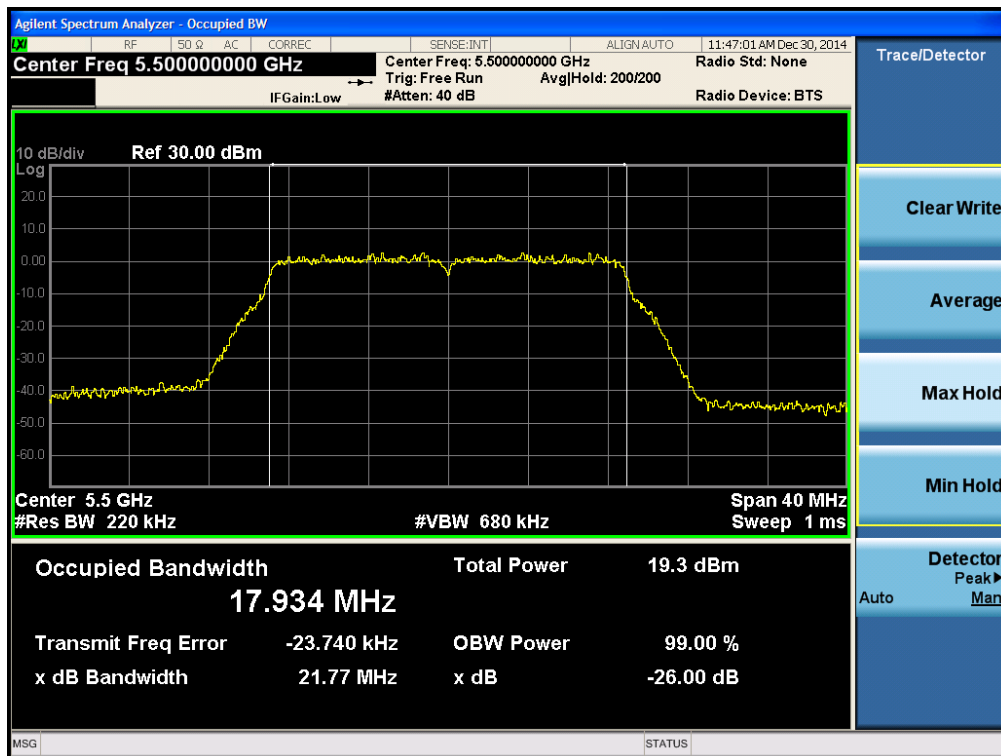
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.64 & ANT 1



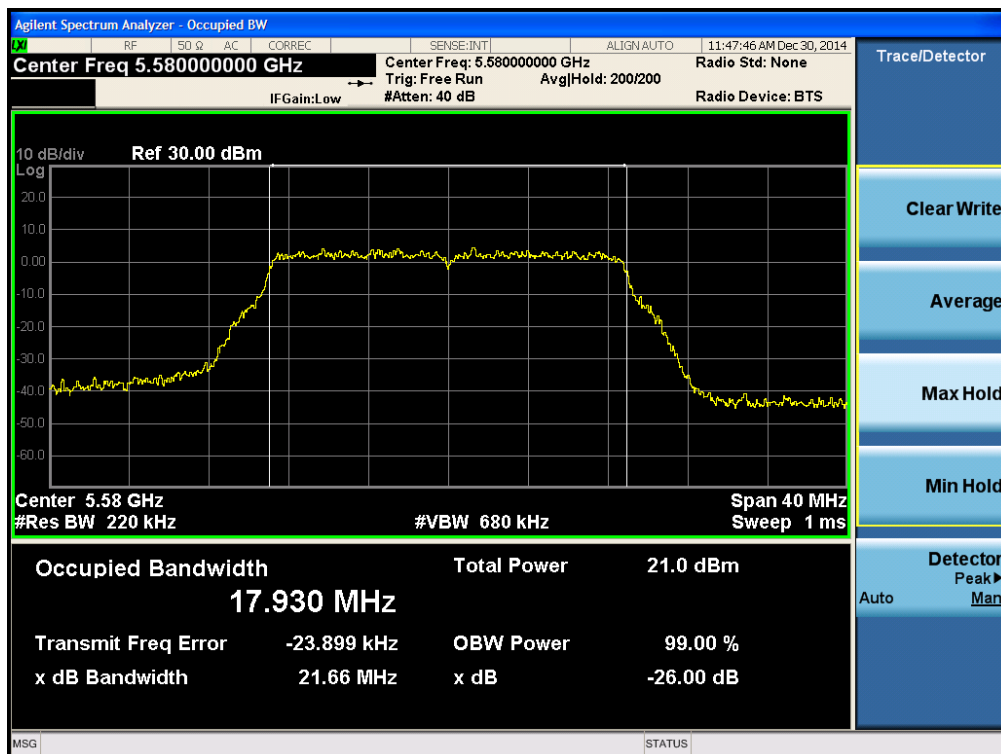
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.100 & ANT 1



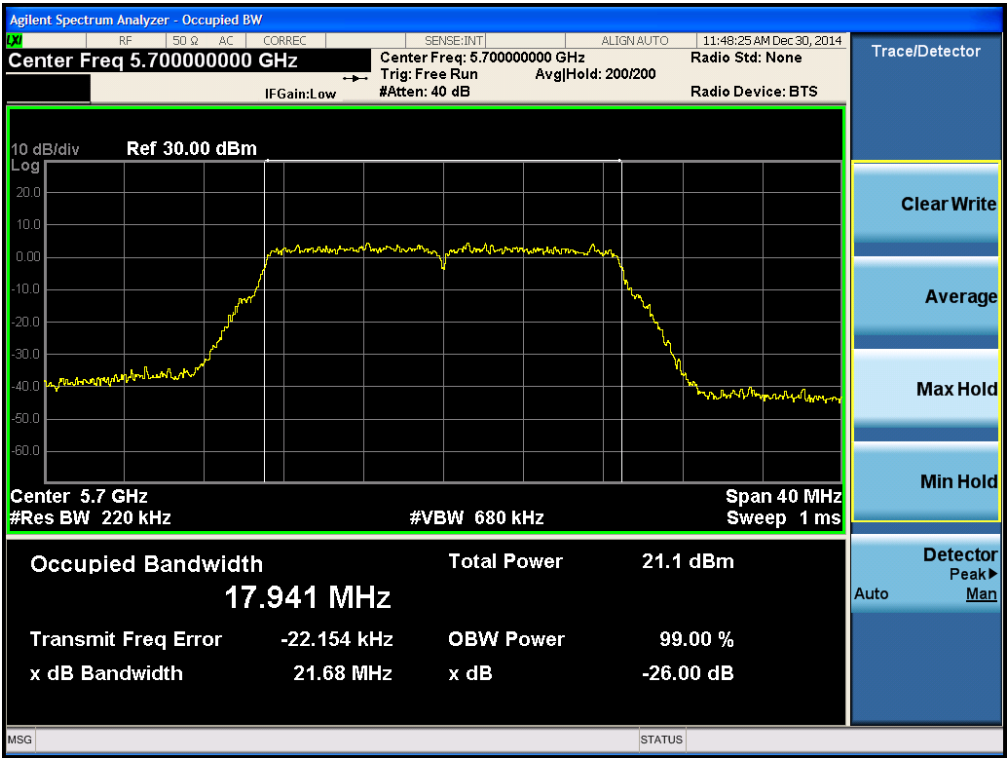
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.116 & ANT 1



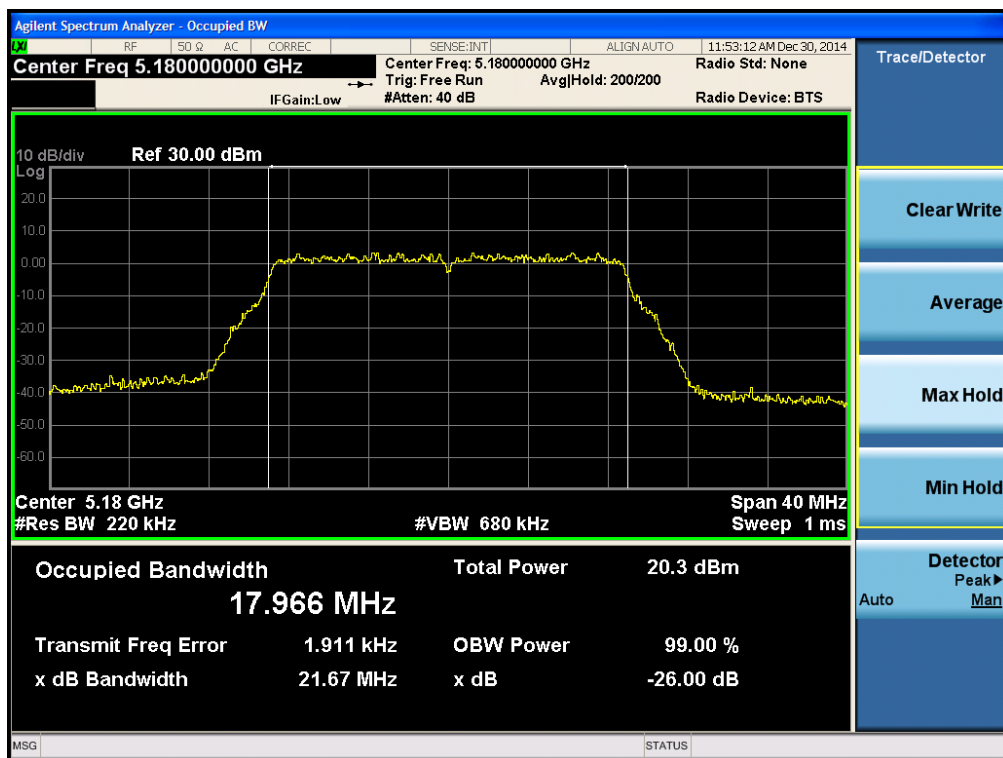
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.140 & ANT 1



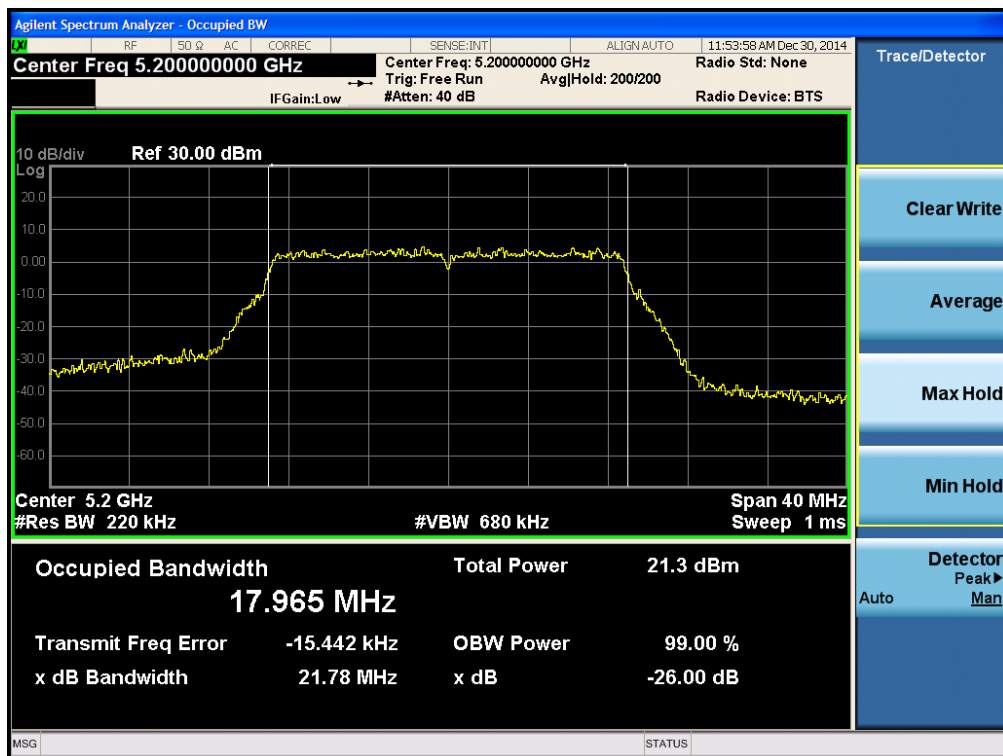
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.36 & ANT 2



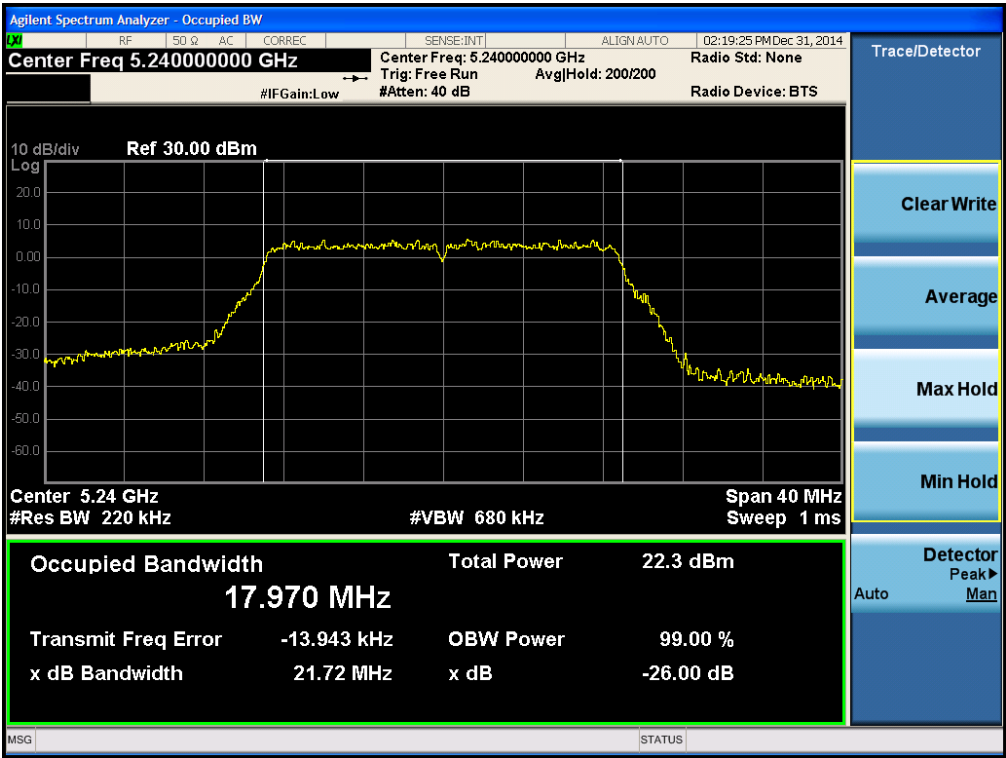
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.40 & ANT 2



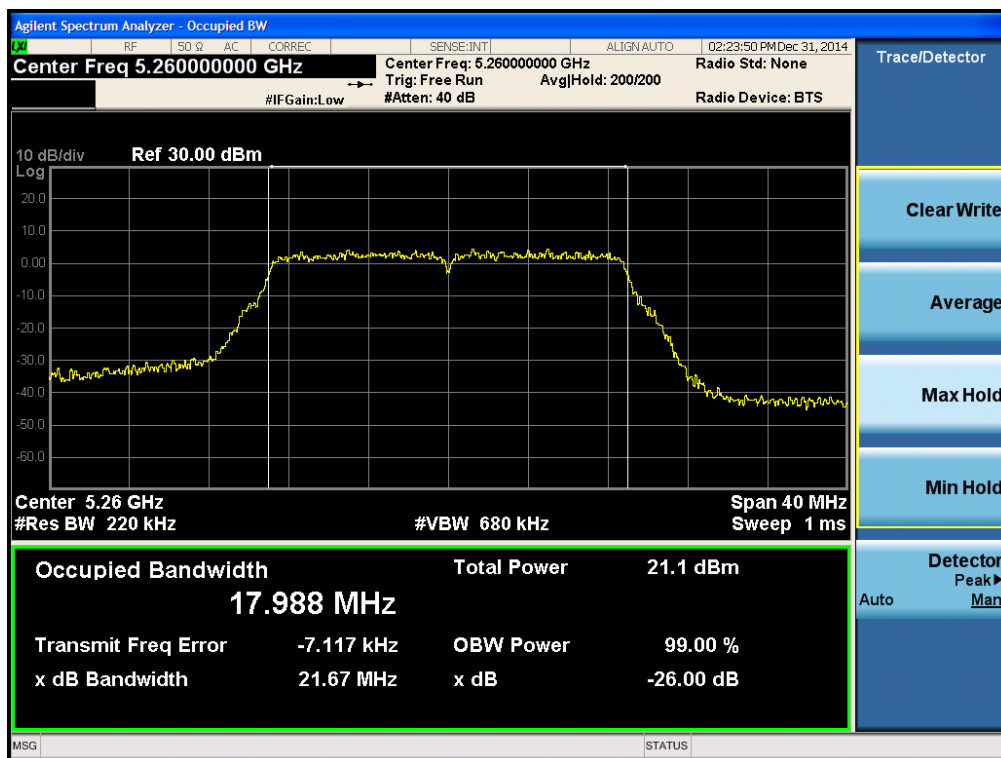
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.48 & ANT 2



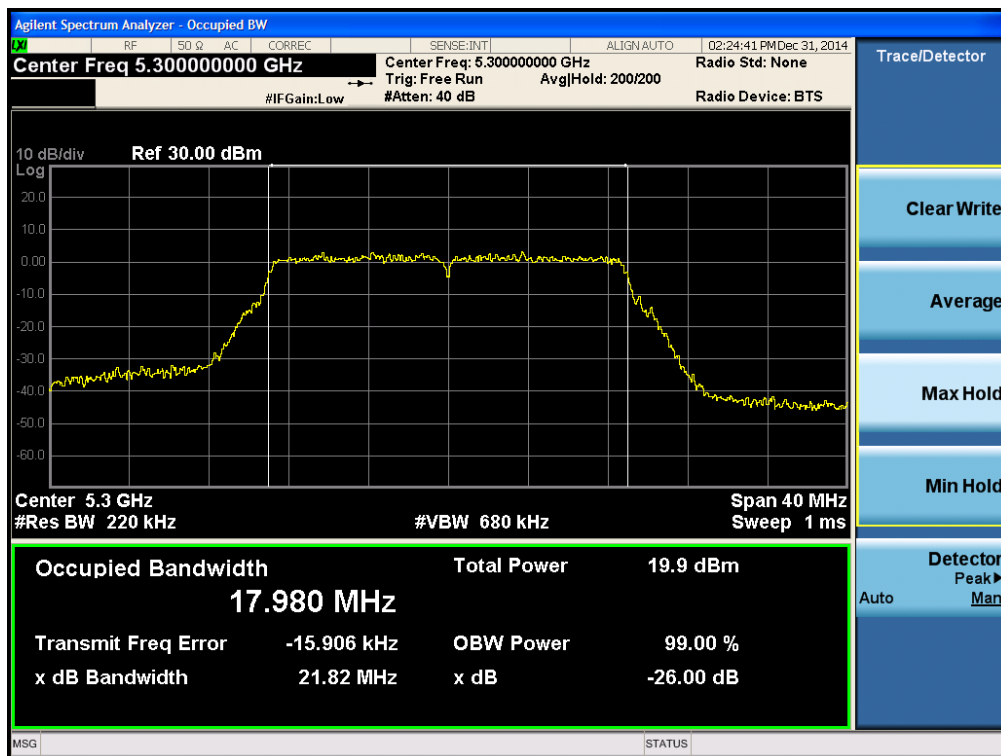
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.52 & ANT 2



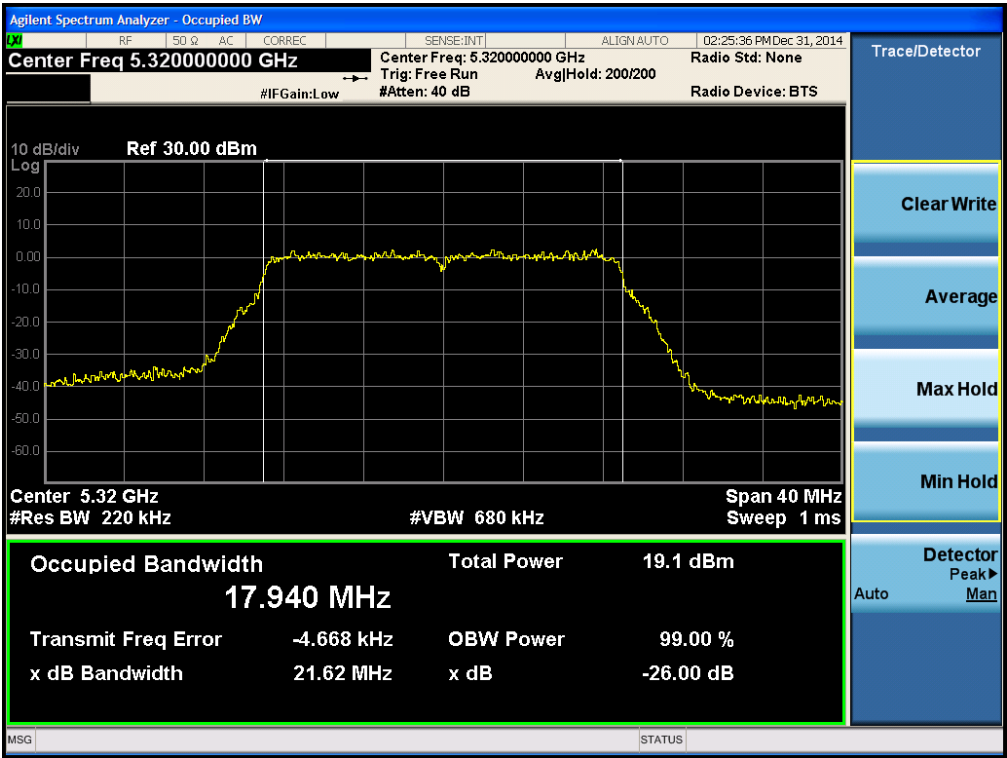
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.60 & ANT 2



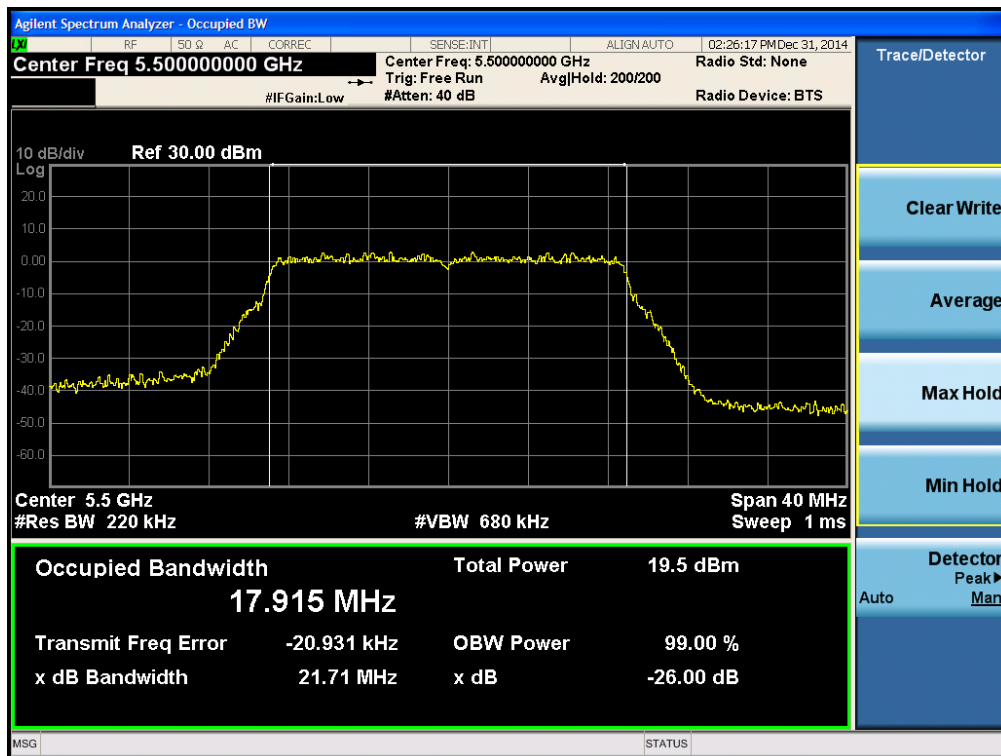
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.64 & ANT 2



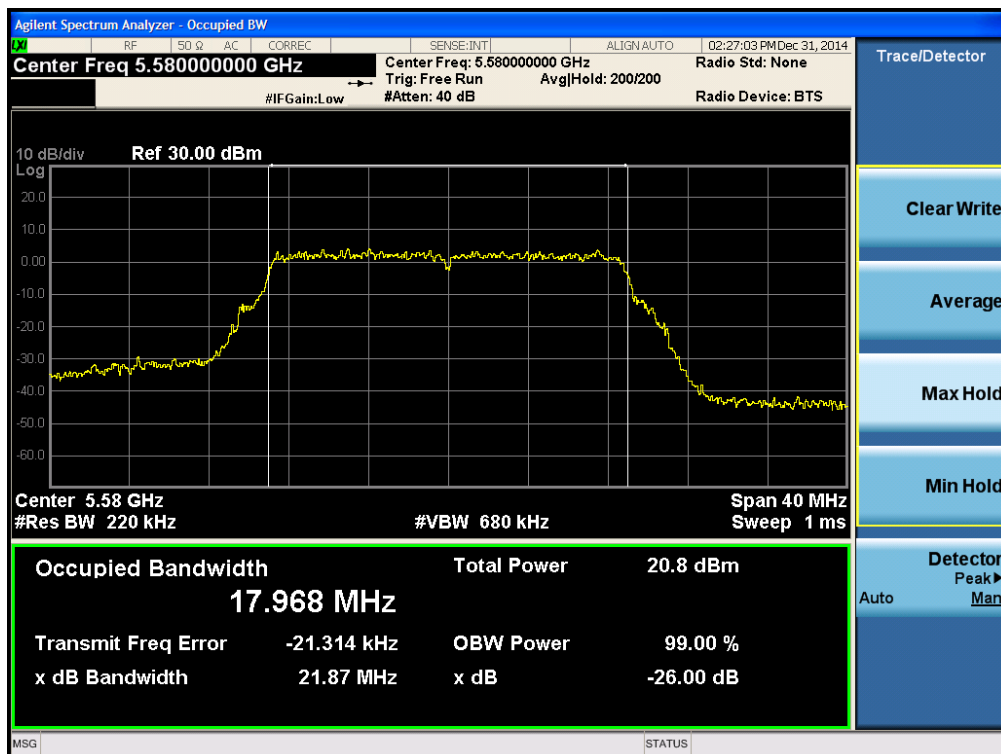
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.100 & ANT 2



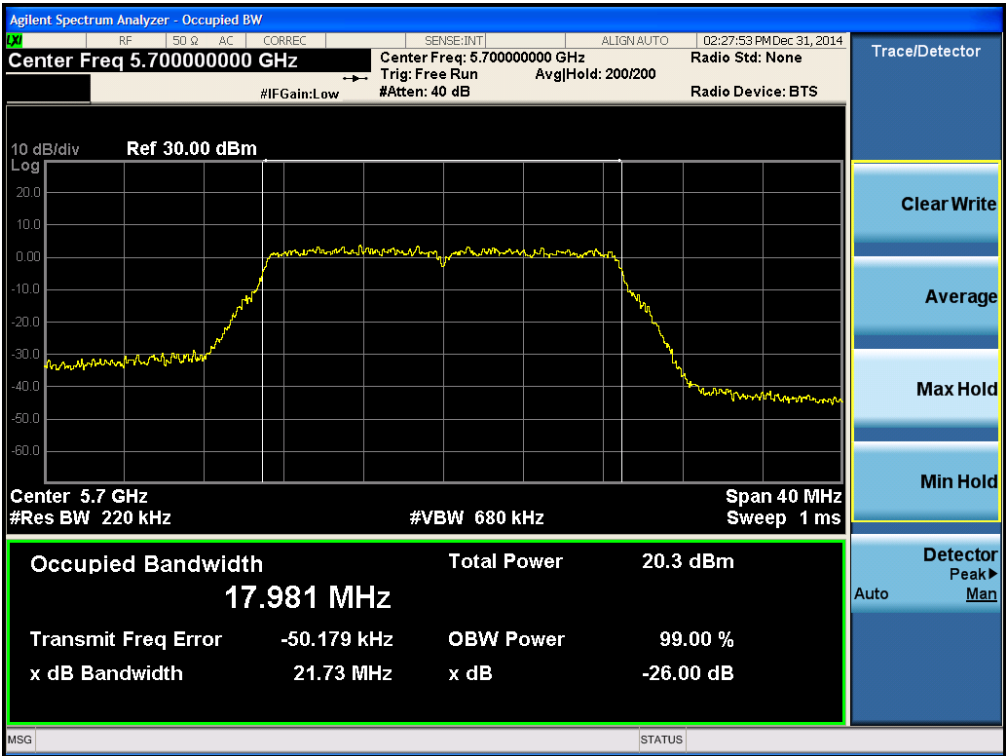
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.116 & ANT 2



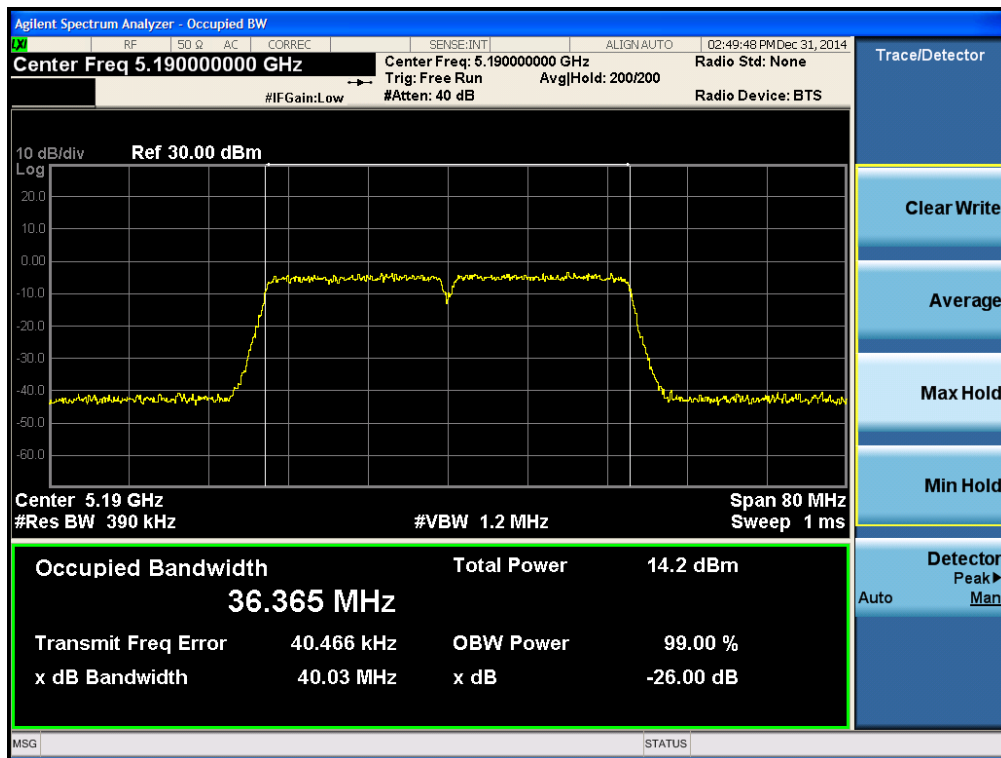
26 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.140 & ANT 2



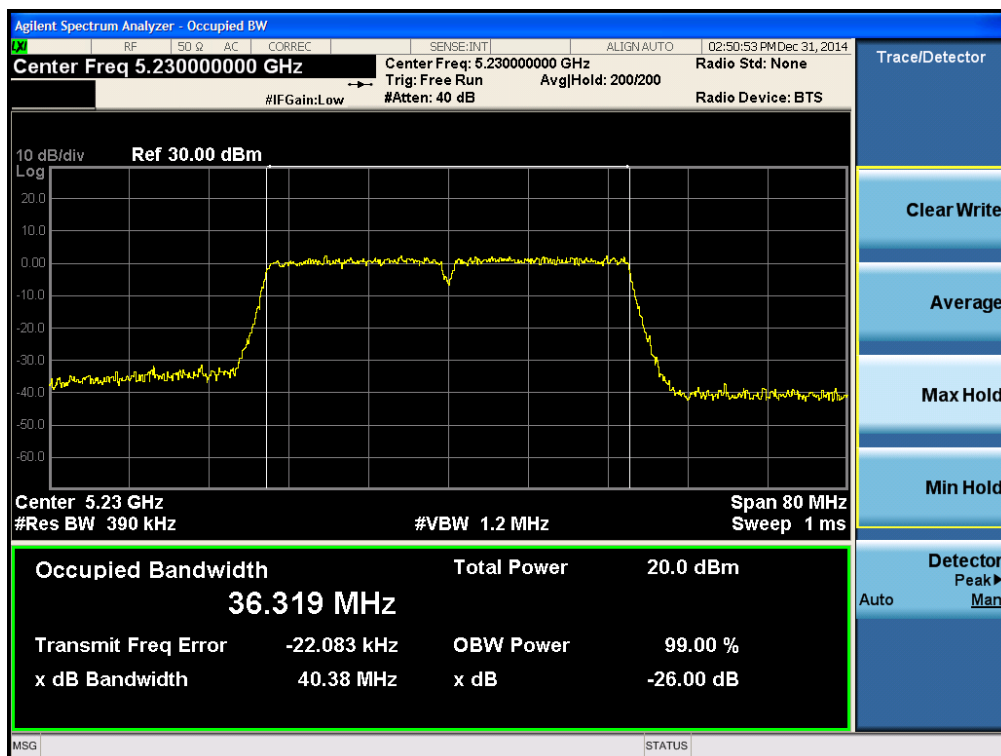
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.38 & ANT 1



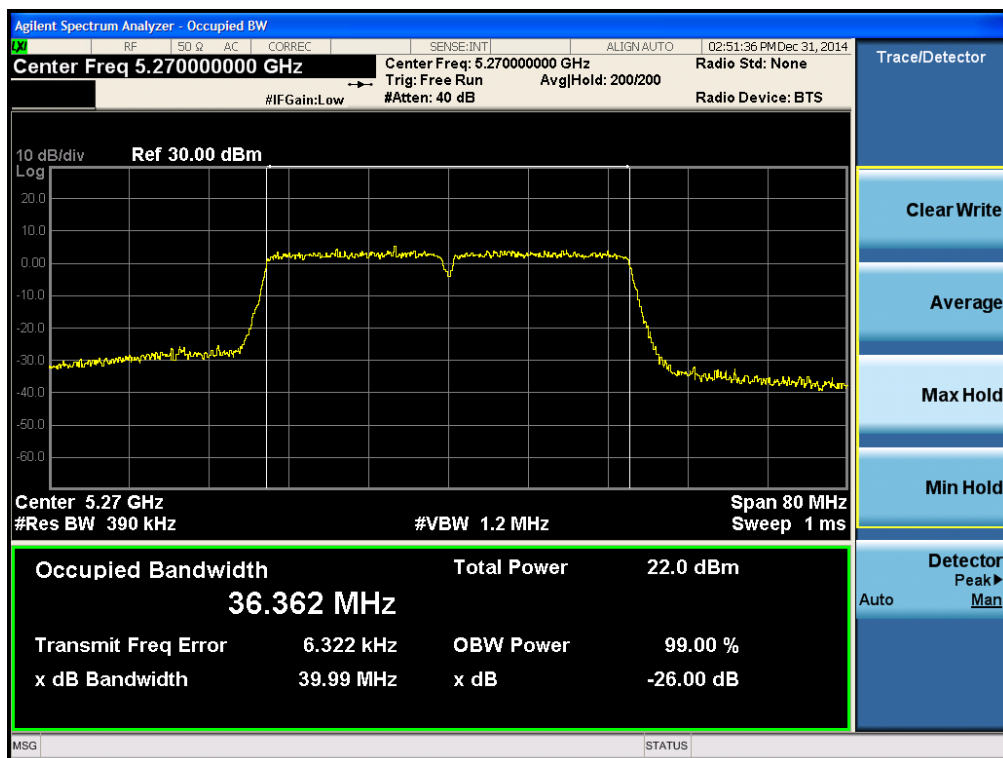
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.46 & ANT 1



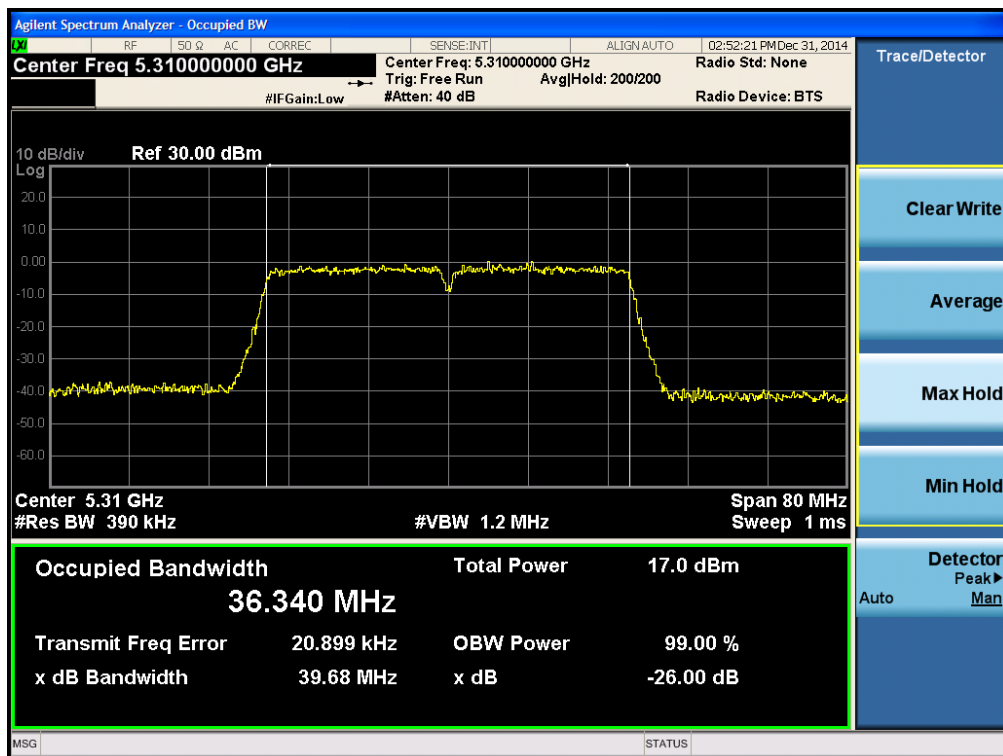
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.54 & ANT 1



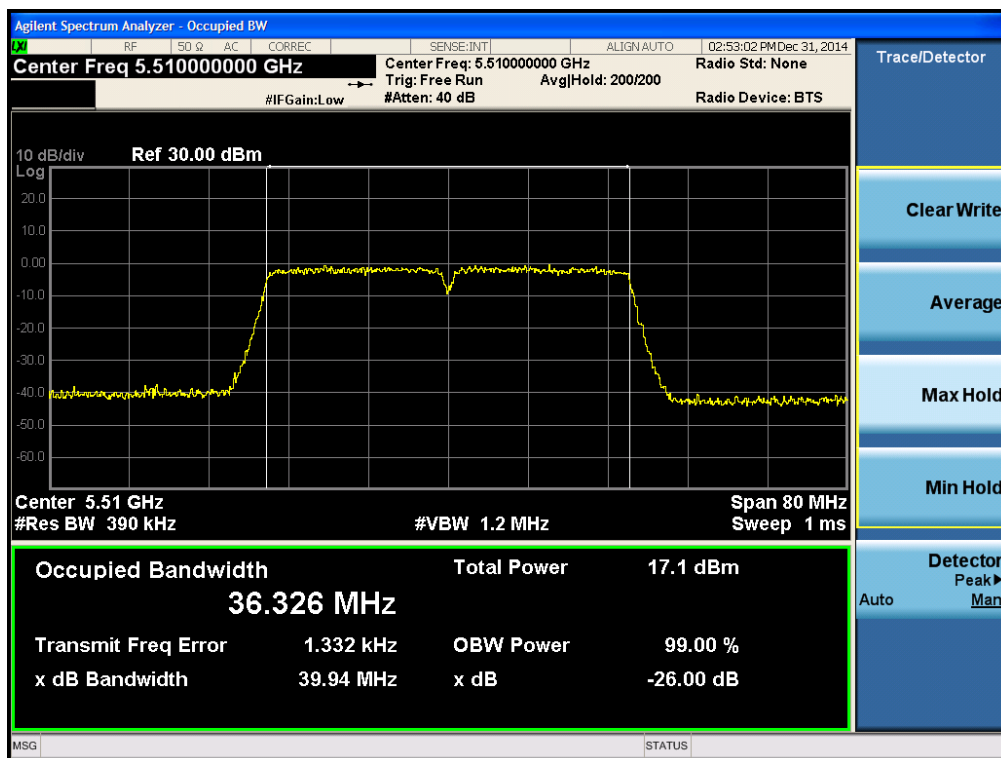
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.62 & ANT 1



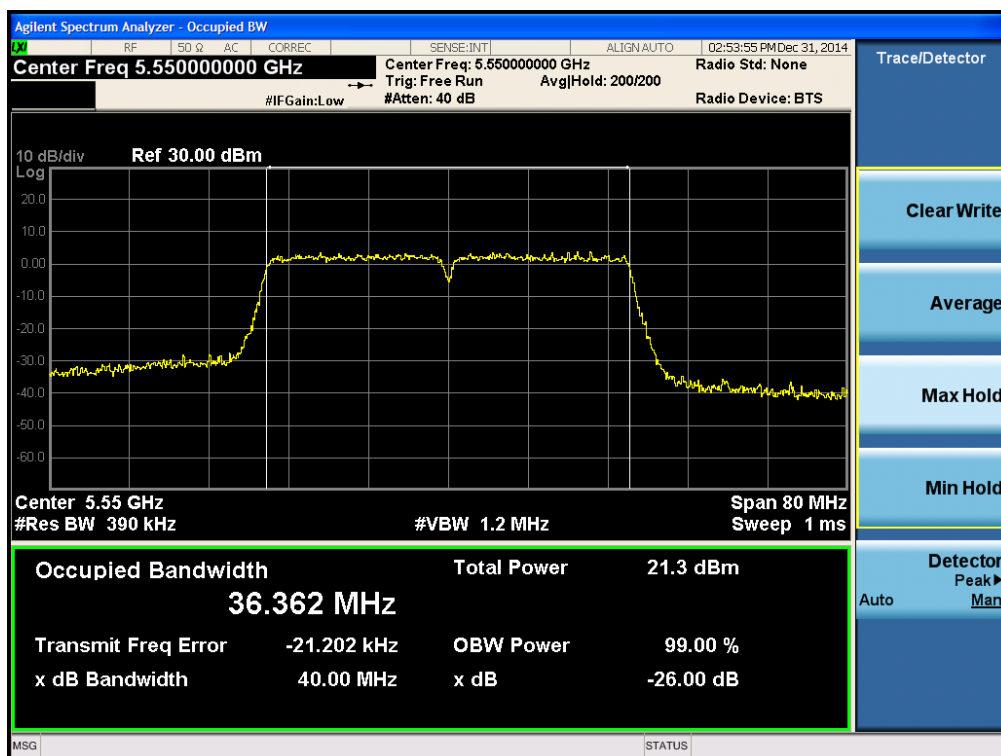
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.102 & ANT 1



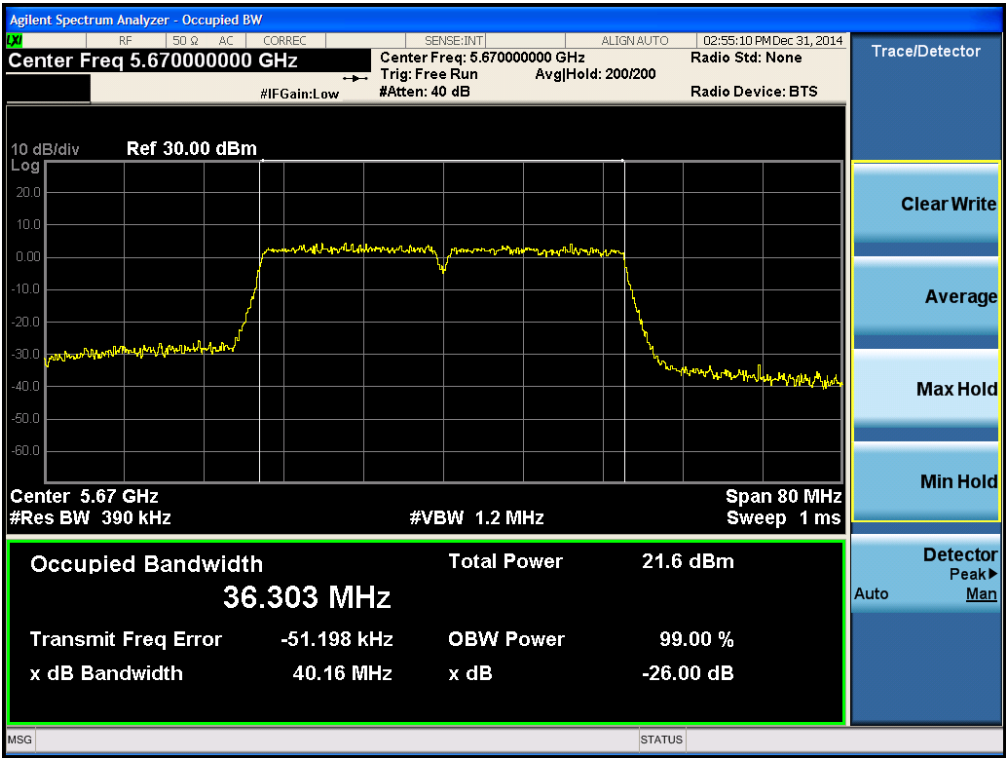
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.110 & ANT 1



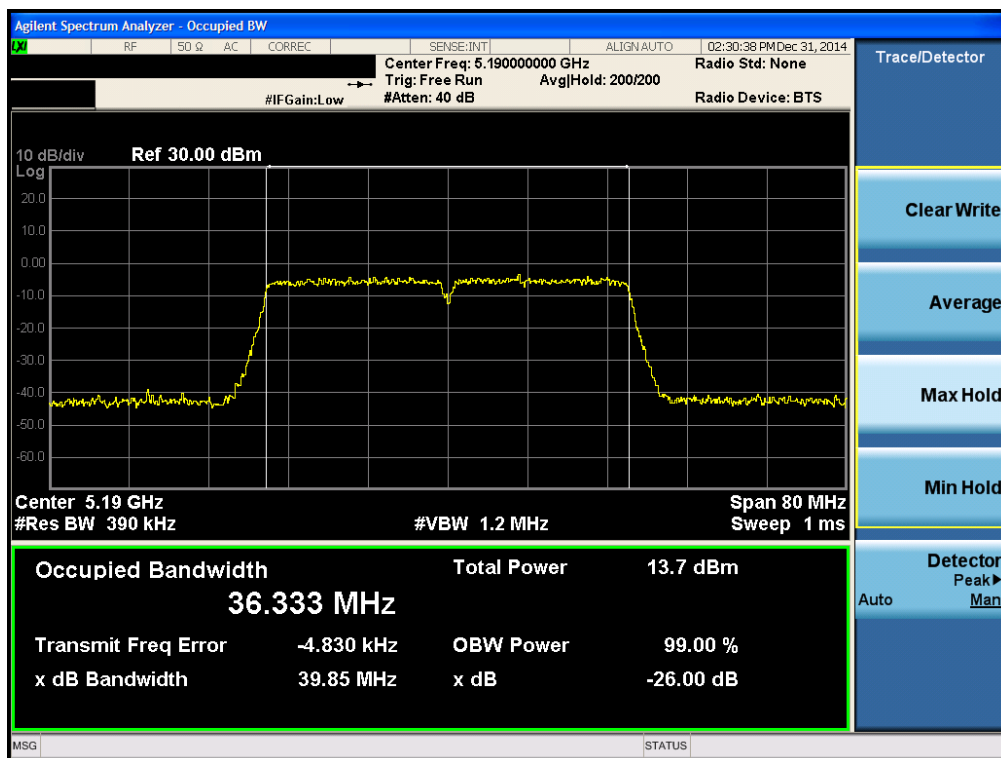
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.134 & ANT 1



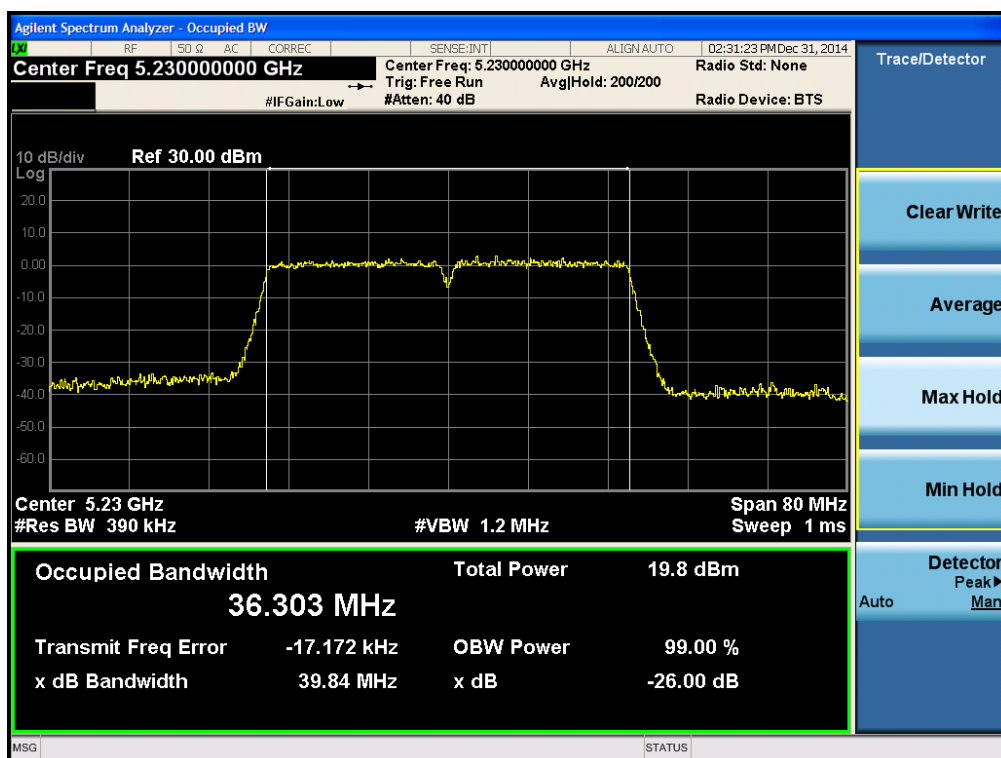
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.38 & ANT 2



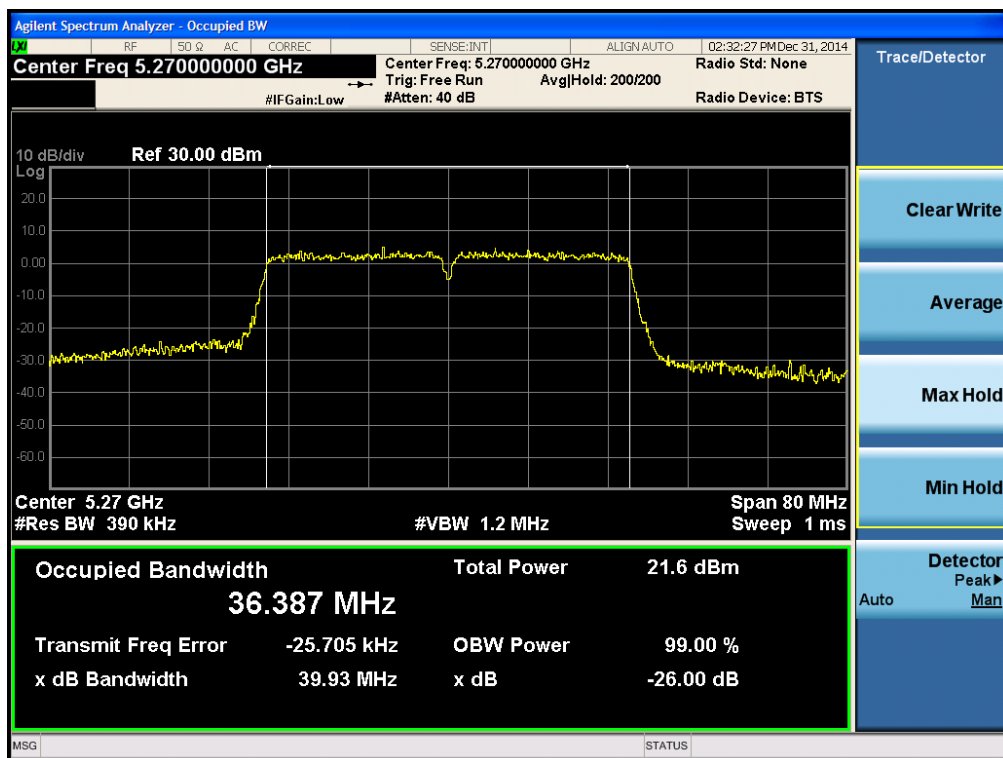
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.46 & ANT 2



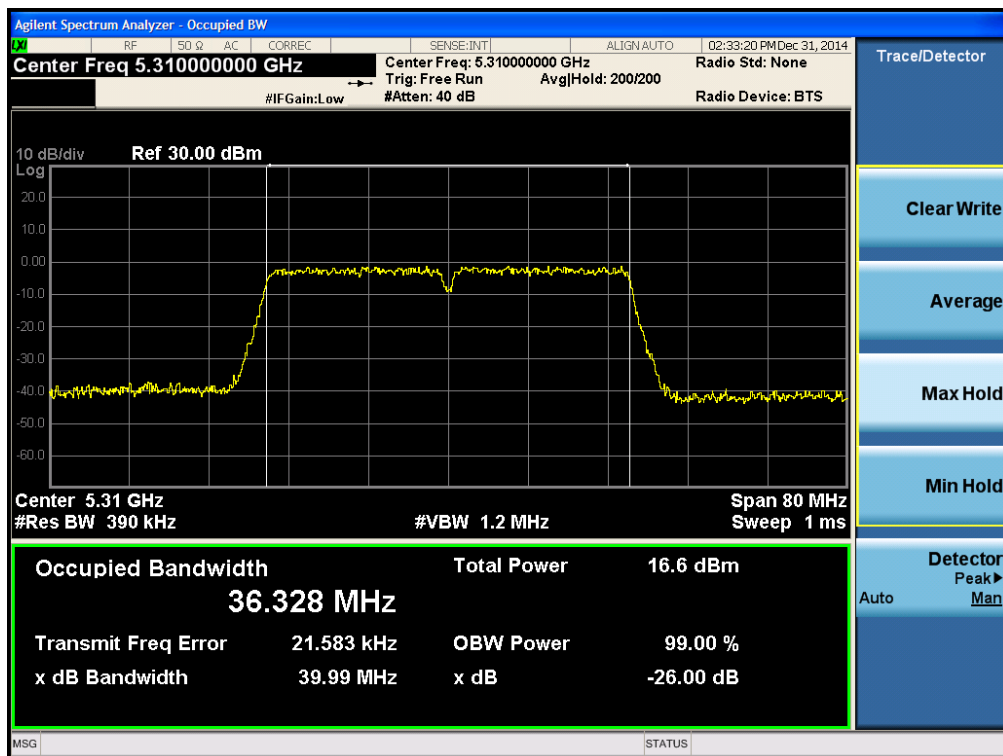
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.54 & ANT 2



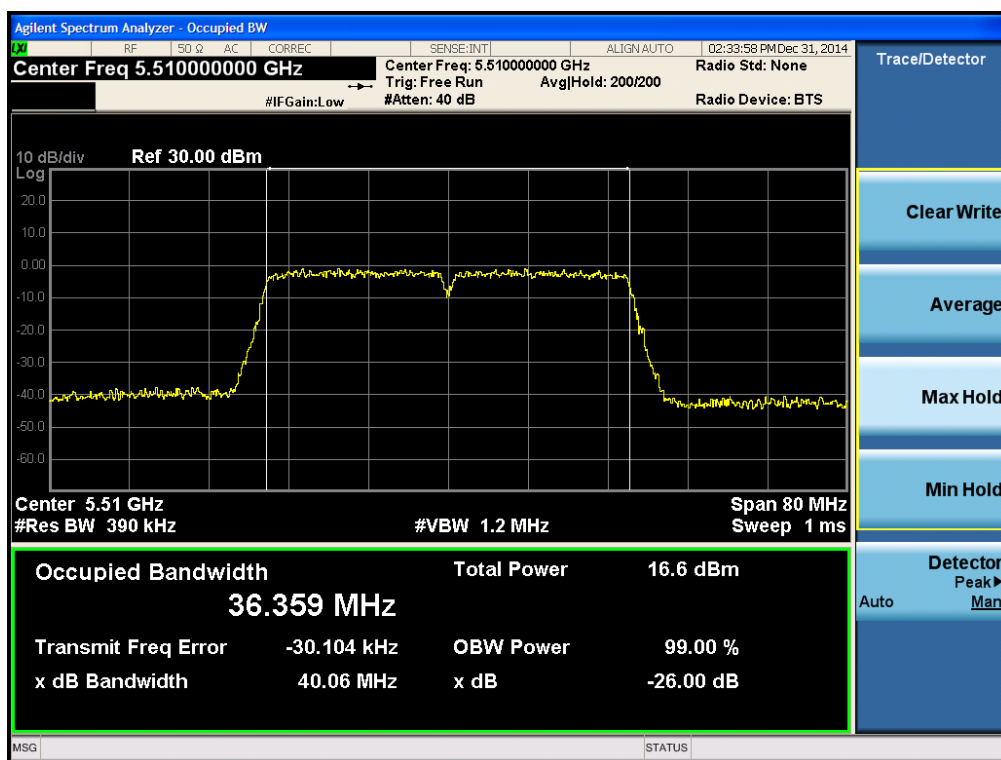
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.62 & ANT 2



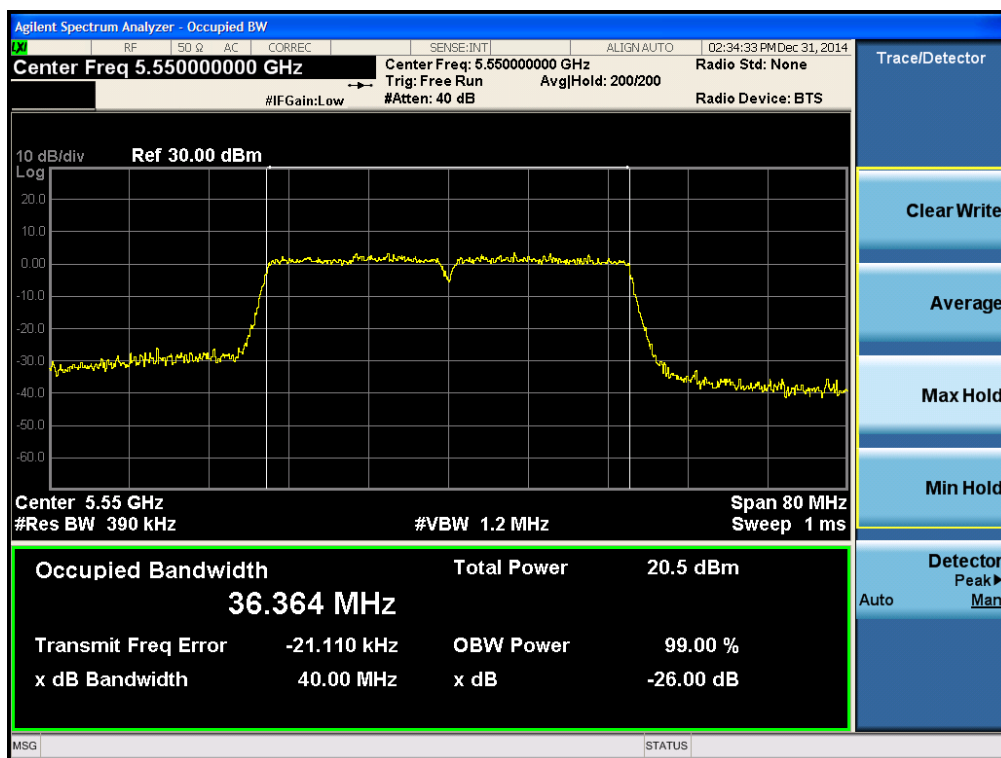
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.102 & ANT 2



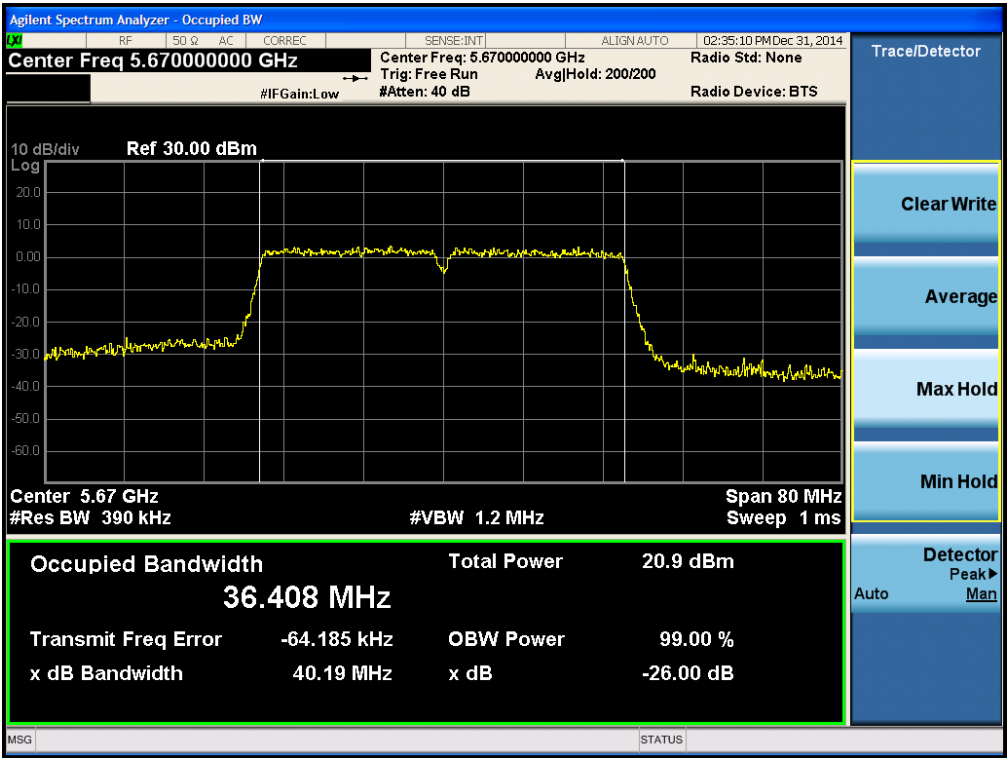
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.110 & ANT 2



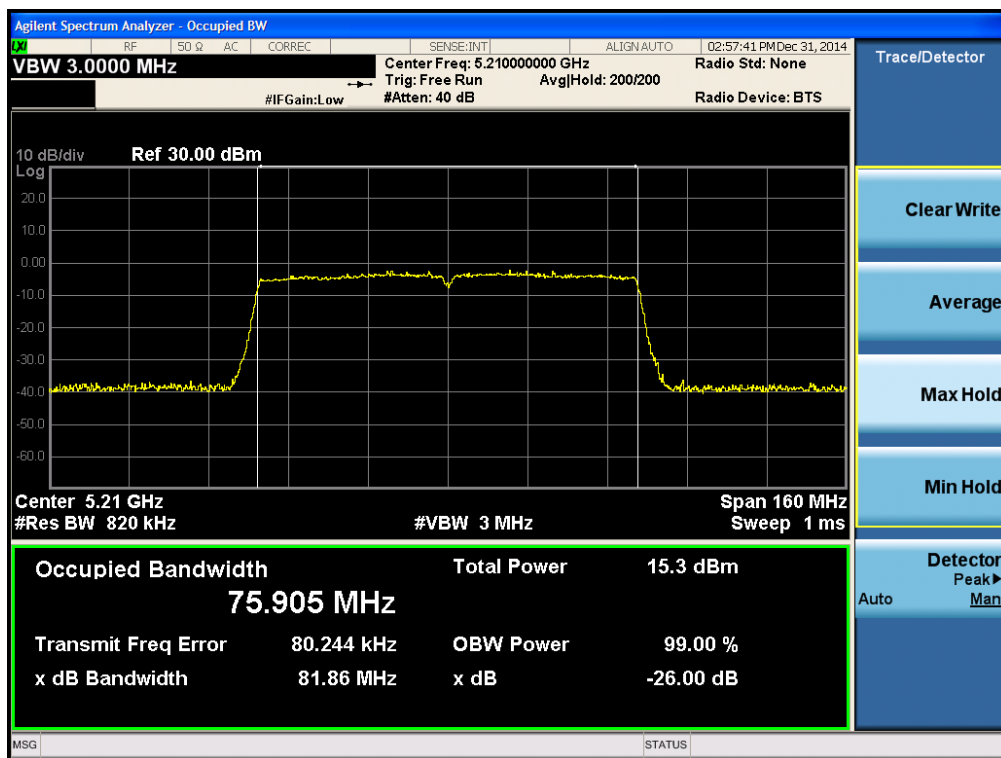
26 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.134 & ANT 2



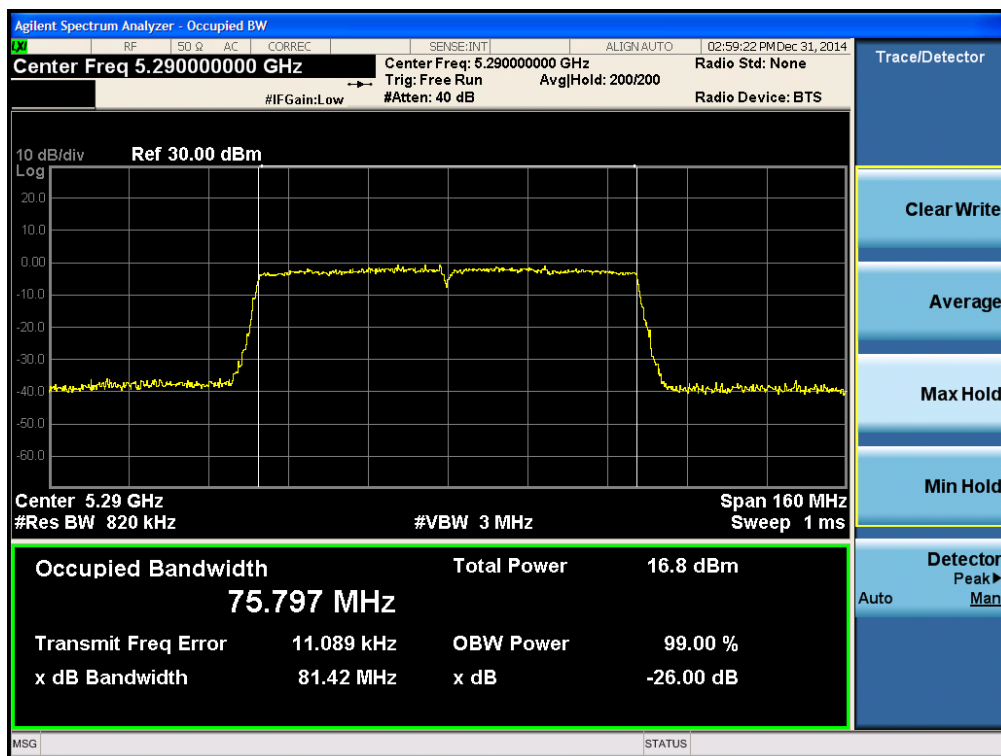
26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.42 & ANT 1



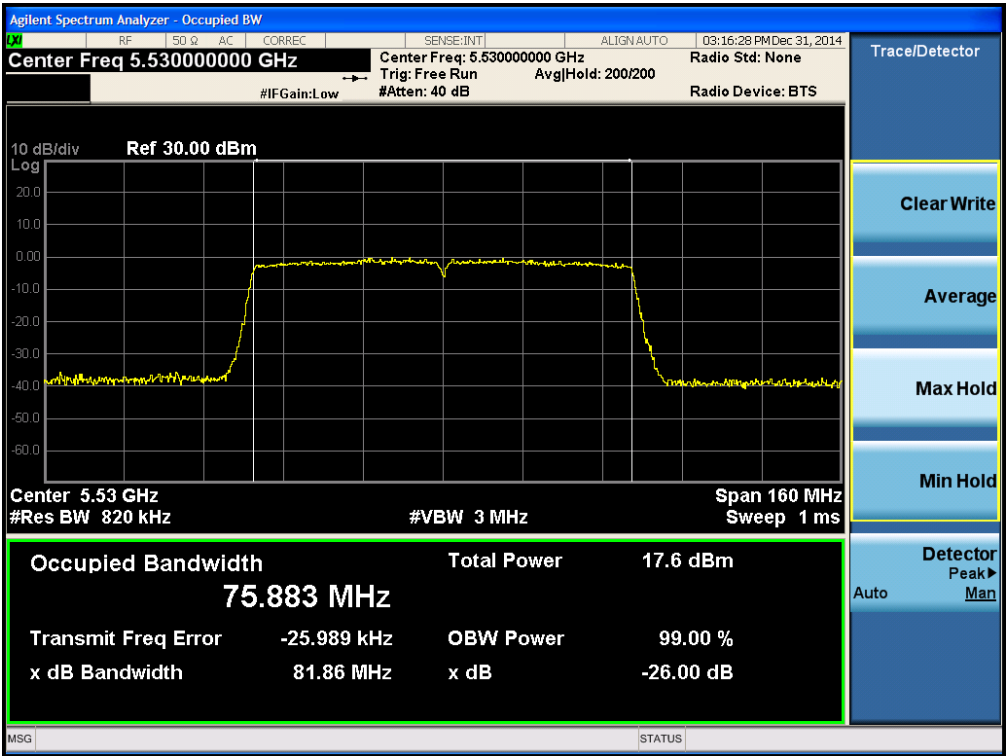
26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.58 & ANT 1



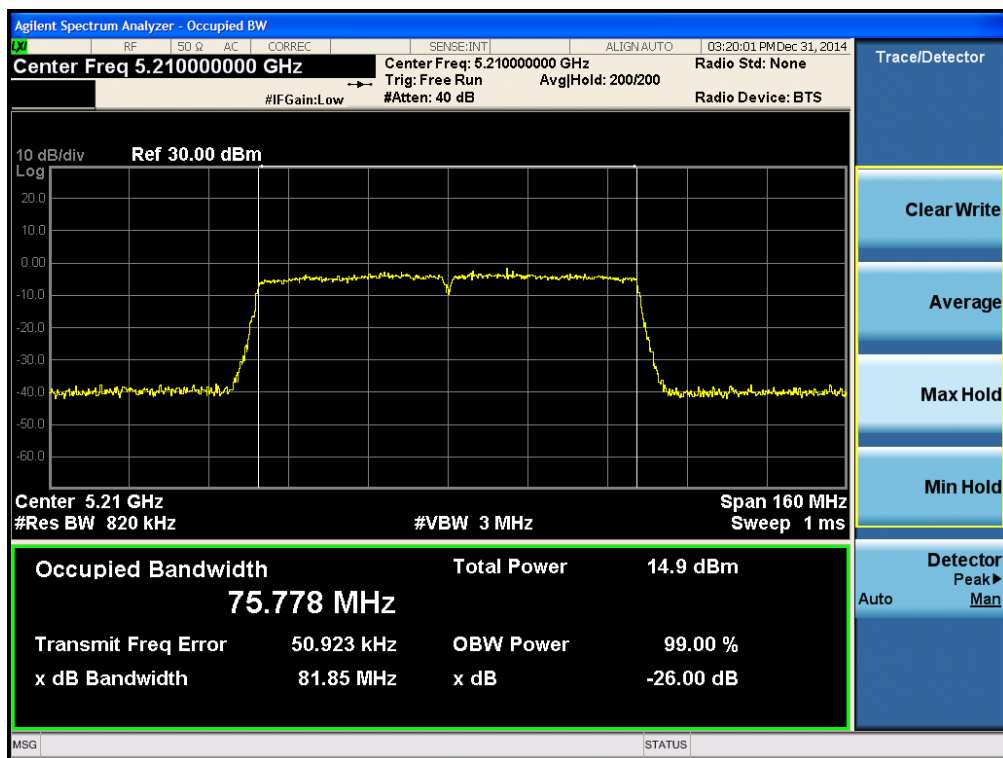
26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.106 & ANT 1



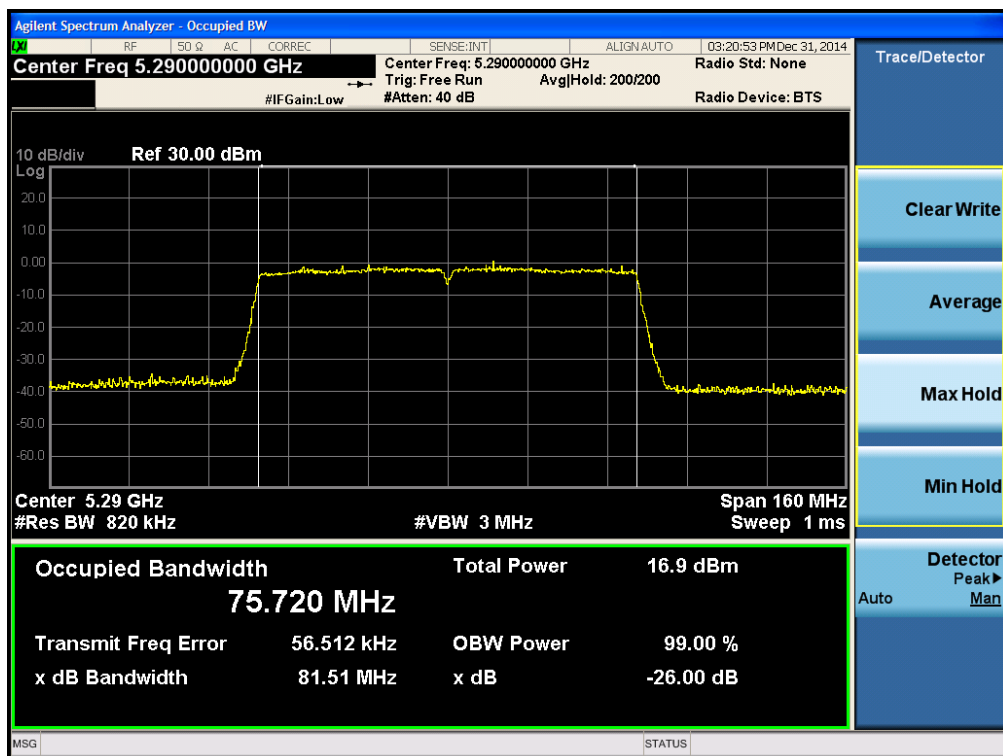
26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.42 & ANT 2



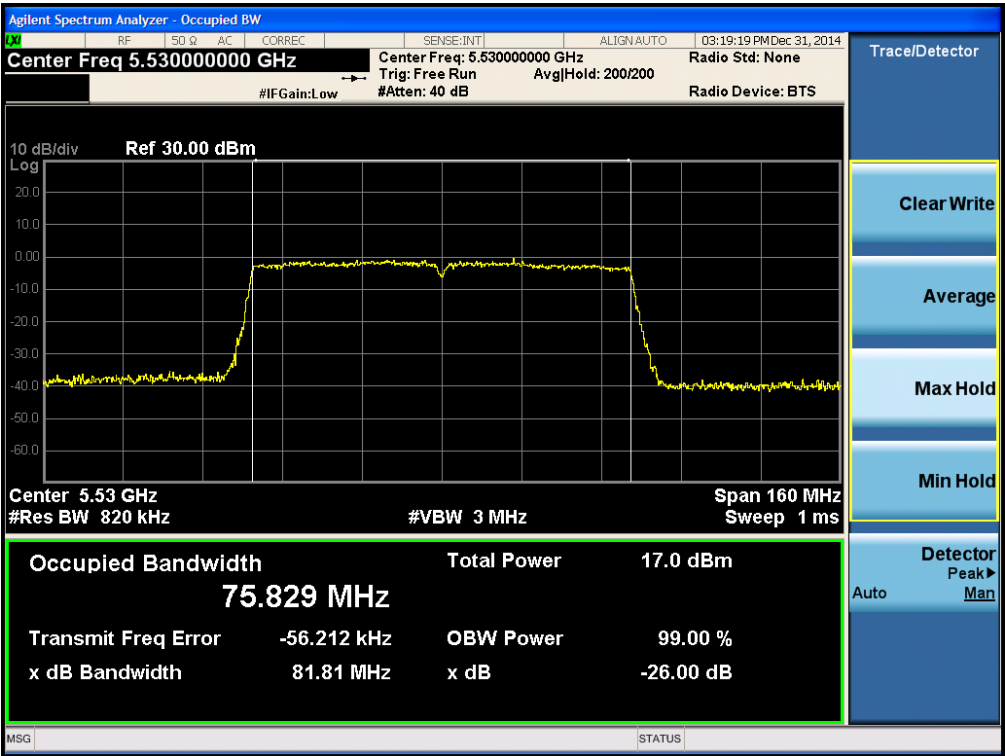
26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.58 & ANT 2



26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.106 & ANT 2



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.

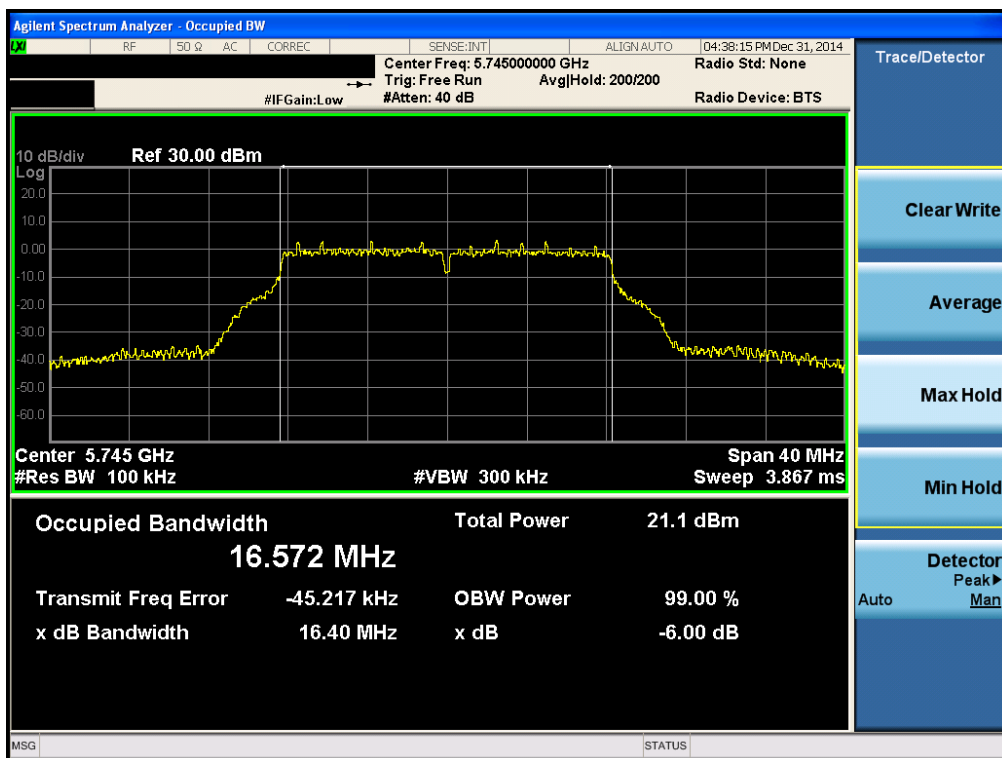
■ Test Results: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]	
				ANT 1	ANT 2
802.11a	U-NII 3	149	5745	16.400	-
		157	5785	16.370	-
		165	5825	16.390	-
802.11n (HT20)	U-NII 3	149	5745	17.620	17.610
		157	5785	17.630	17.610
		165	5825	17.600	17.610
802.11n (HT40)	U-NII 3	151	5755	36.340	36.370
		159	5795	36.370	36.350
802.11ac (VHT80)	U-NII 3	155	5775	75.820	75.790

■ Result Plots

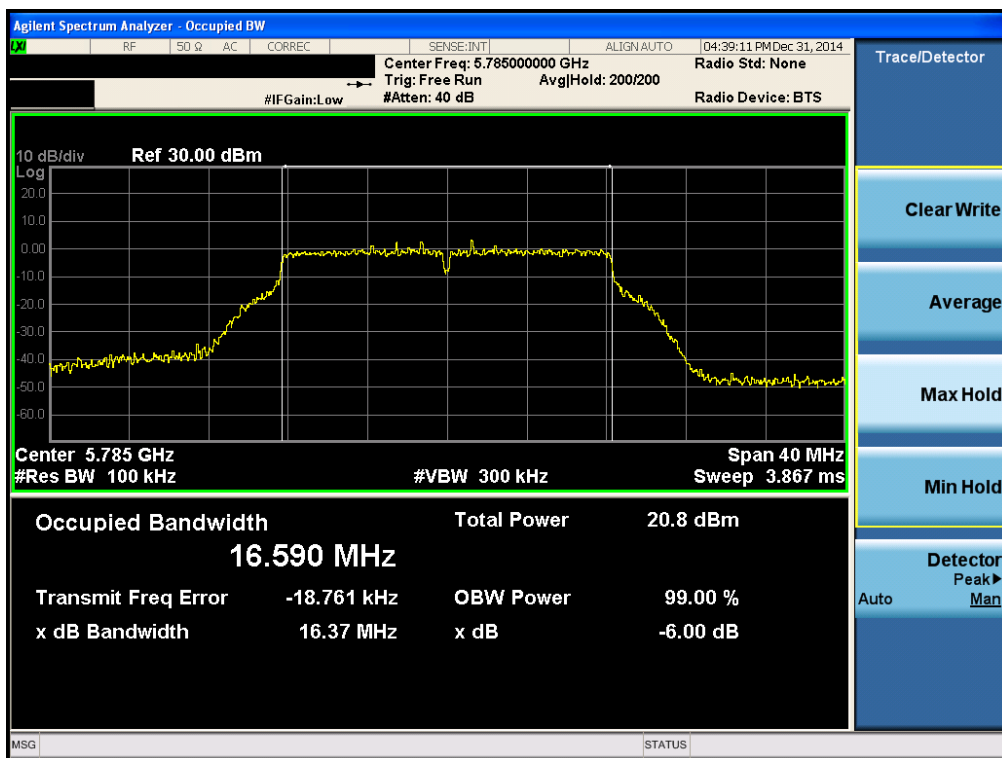
6 dB Bandwidth

Test Mode: 802.11a & Ch.149 & ANT 1



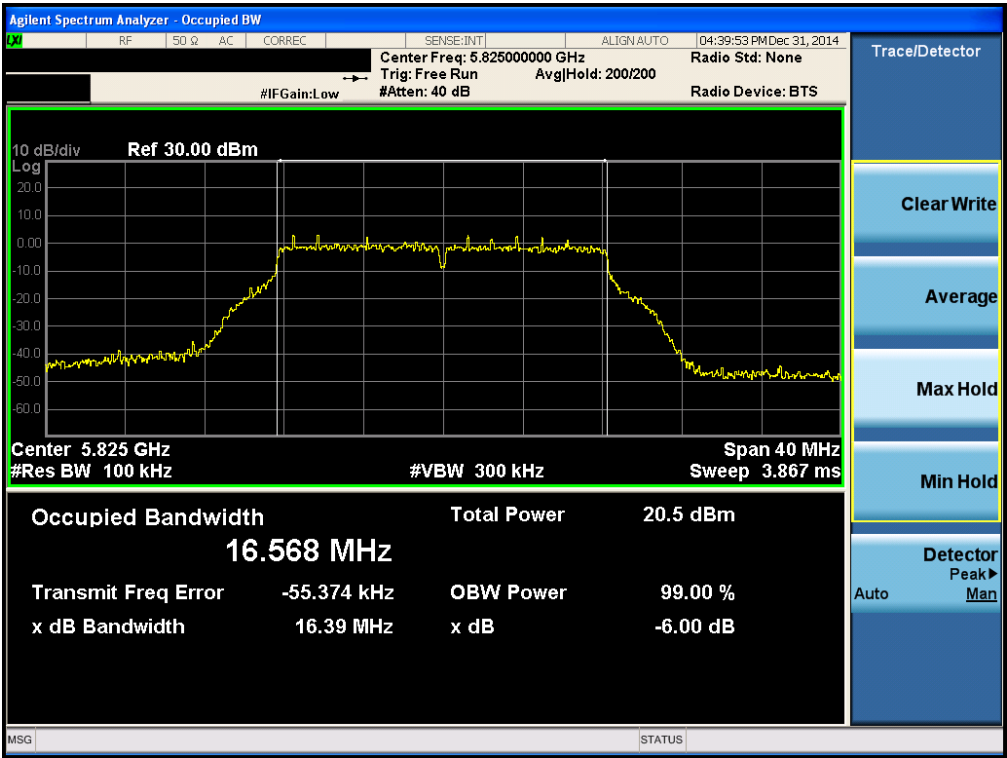
6 dB Bandwidth

Test Mode: 802.11a & Ch.157 & ANT 1



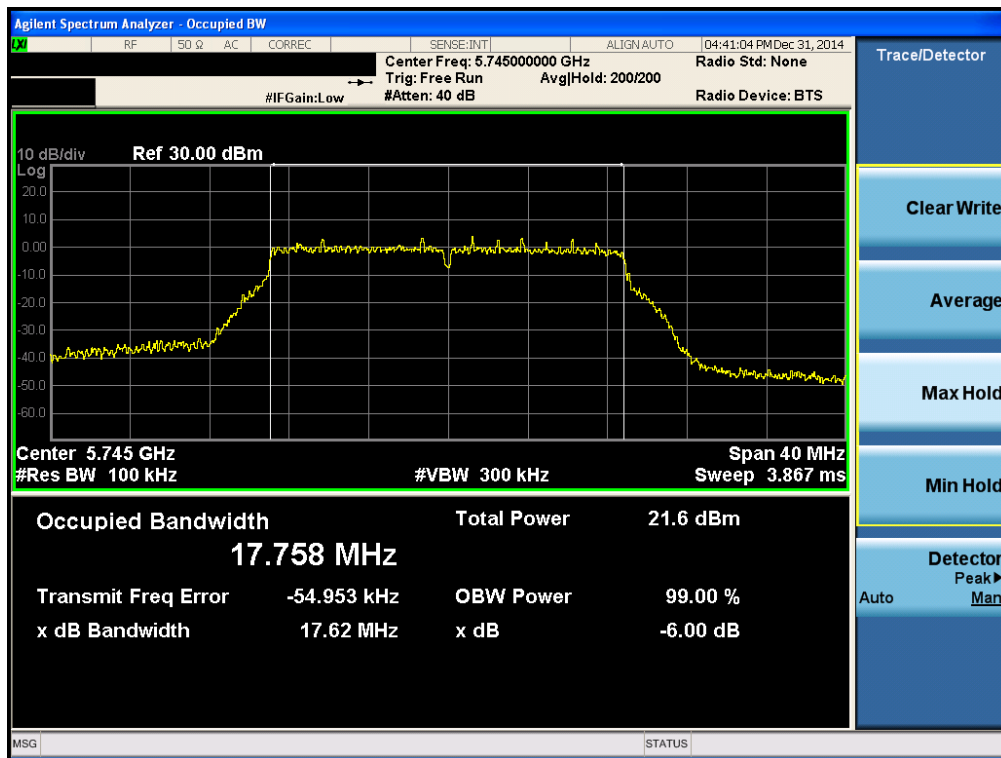
6 dB Bandwidth

Test Mode: 802.11a & Ch.165 & ANT 1



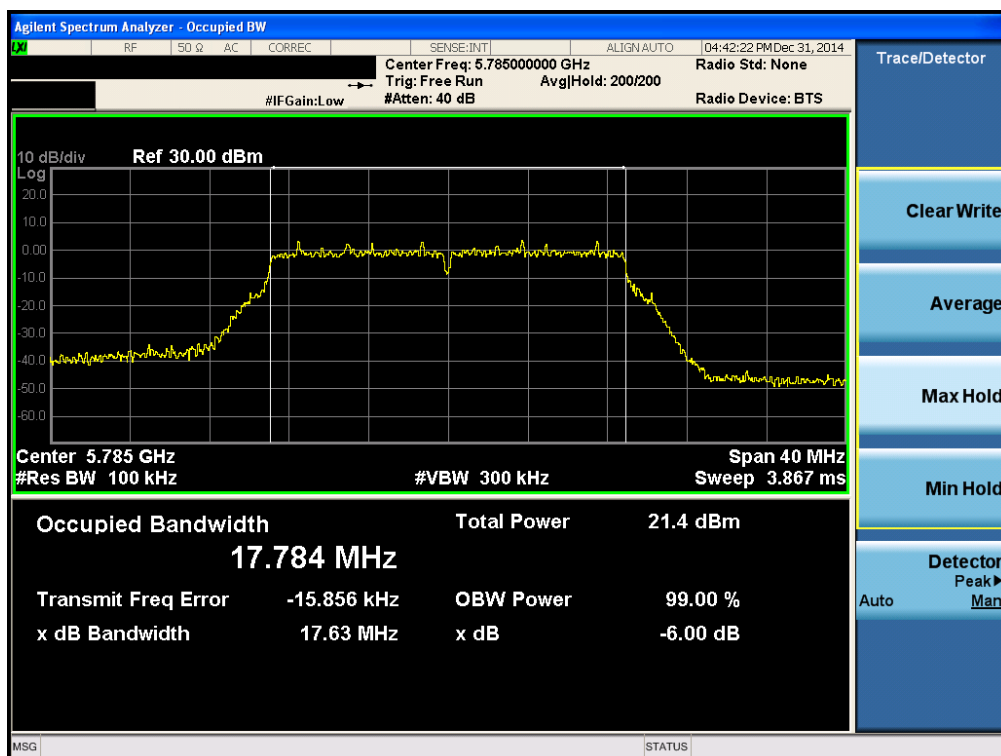
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.149 & ANT 1



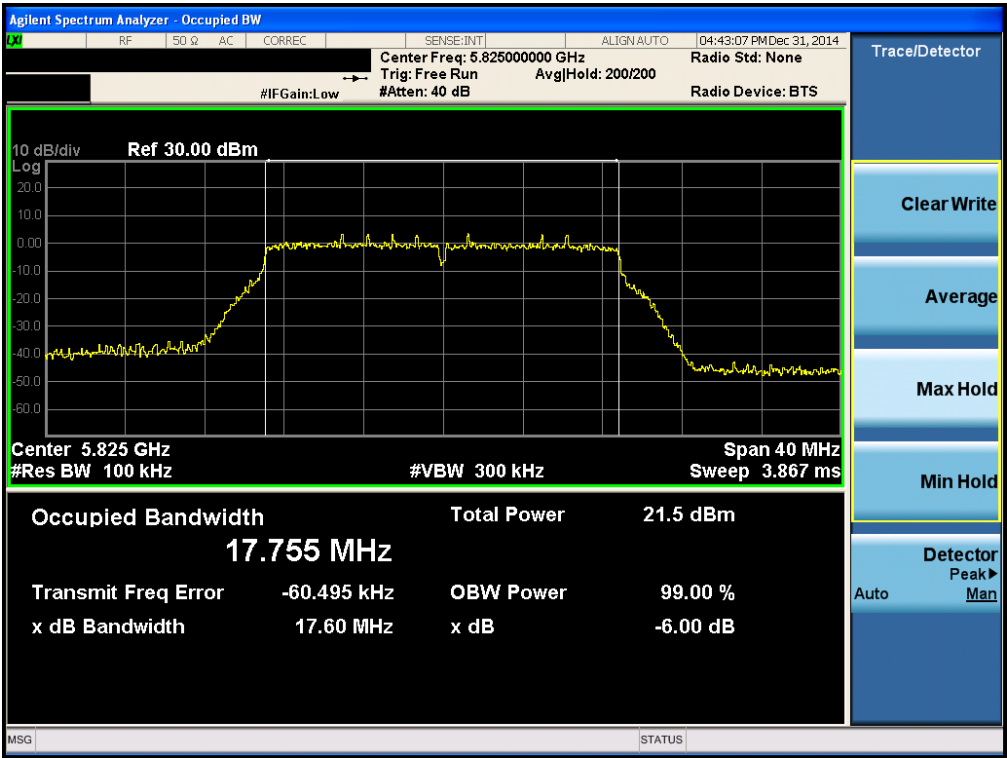
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.157 & ANT 1



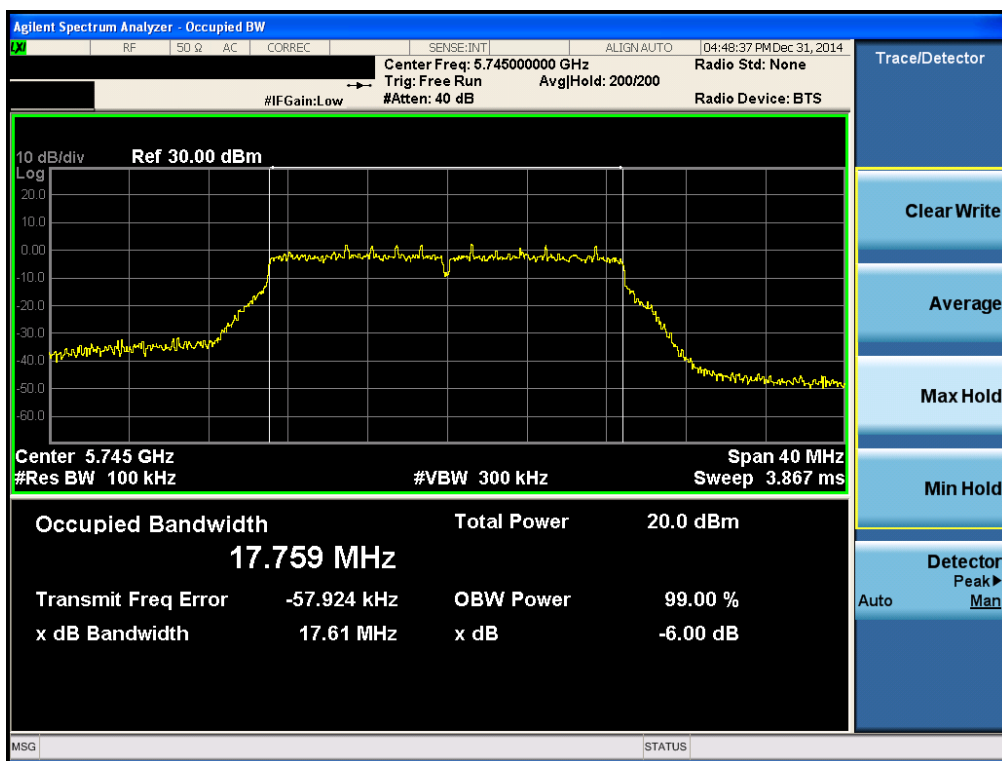
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.165 & ANT 1



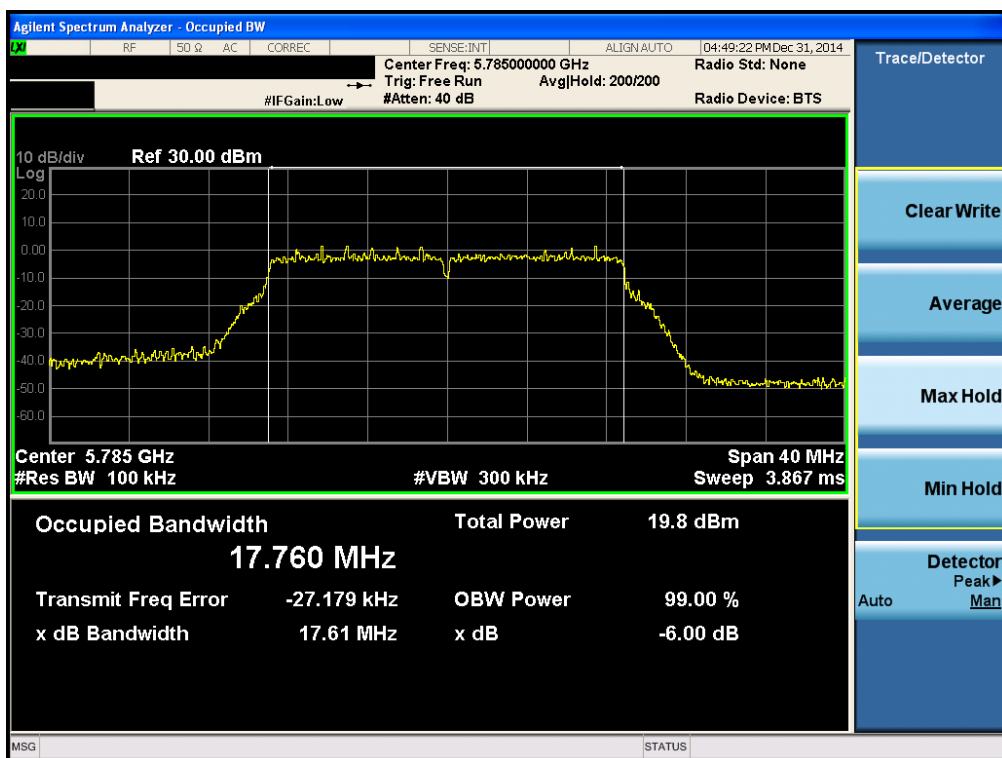
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.149 & ANT 2



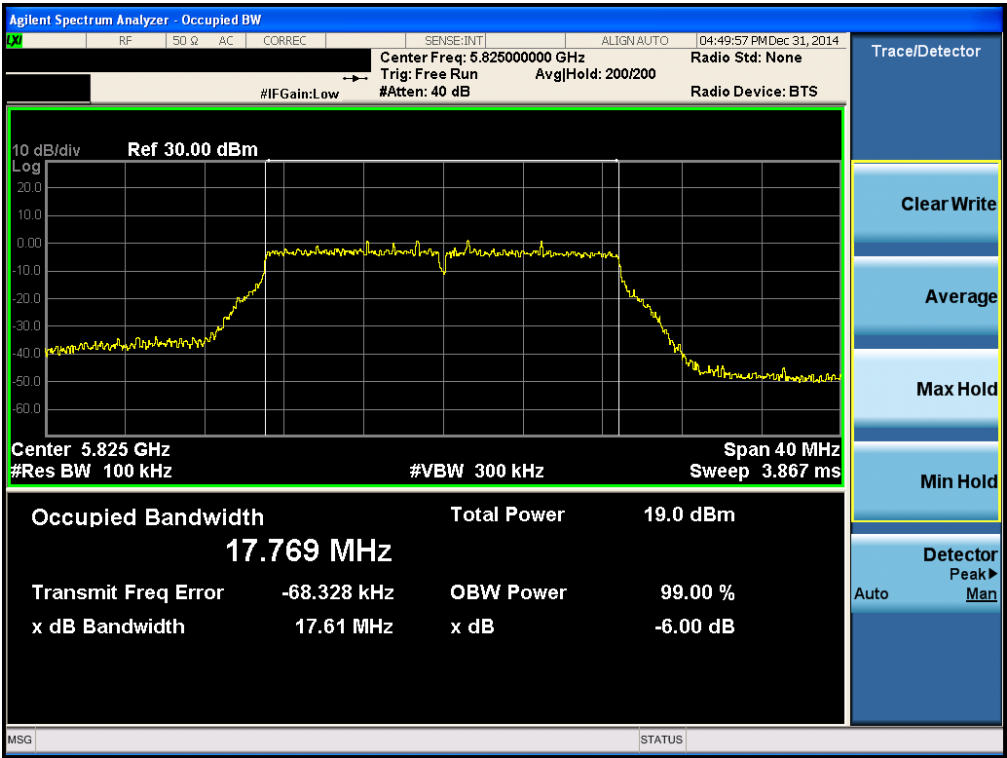
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.157 & ANT 2



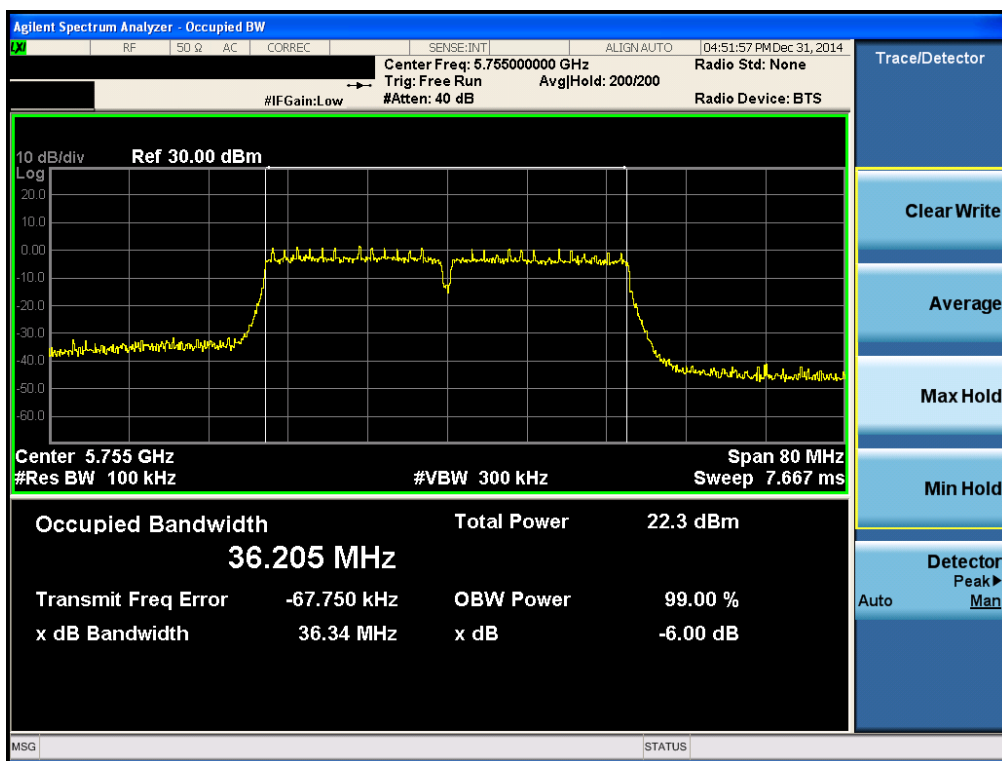
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.165 & ANT 2



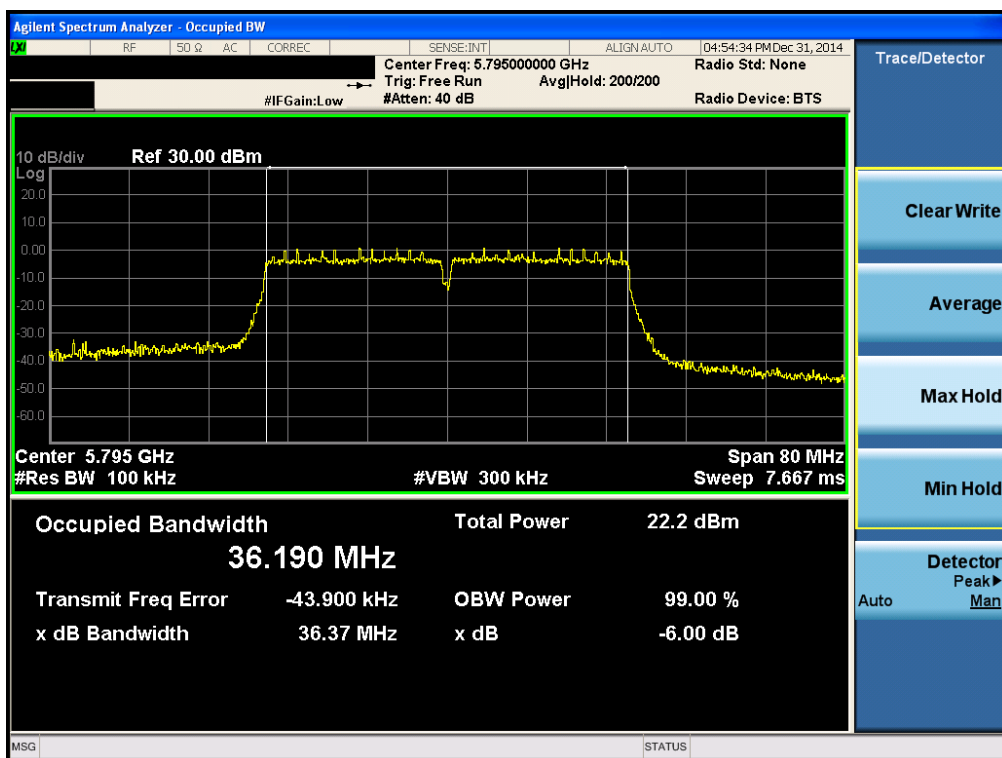
6 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.151 & ANT 1



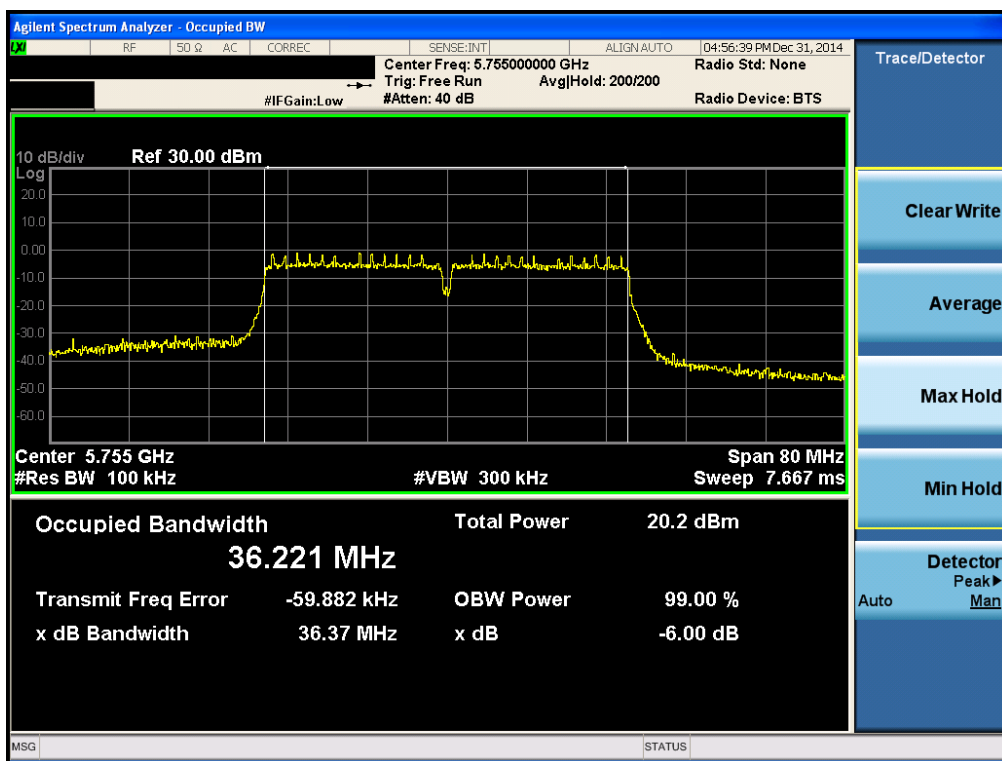
6 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.159 & ANT 1



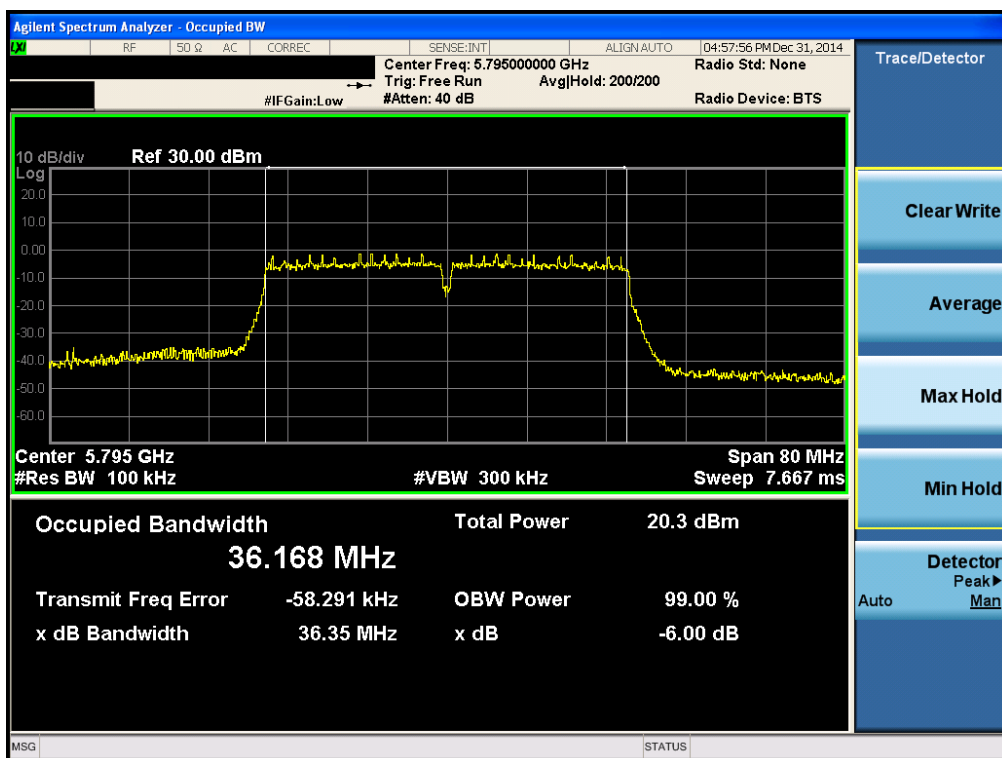
6 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.151 & ANT 2



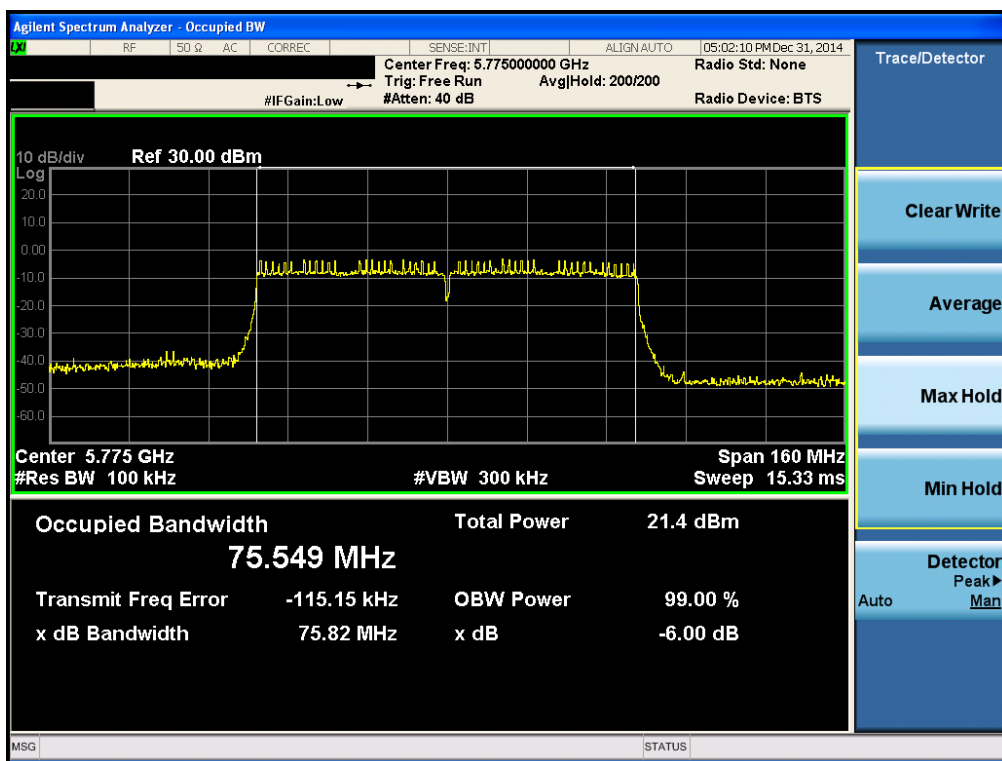
6 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.159 & ANT 2



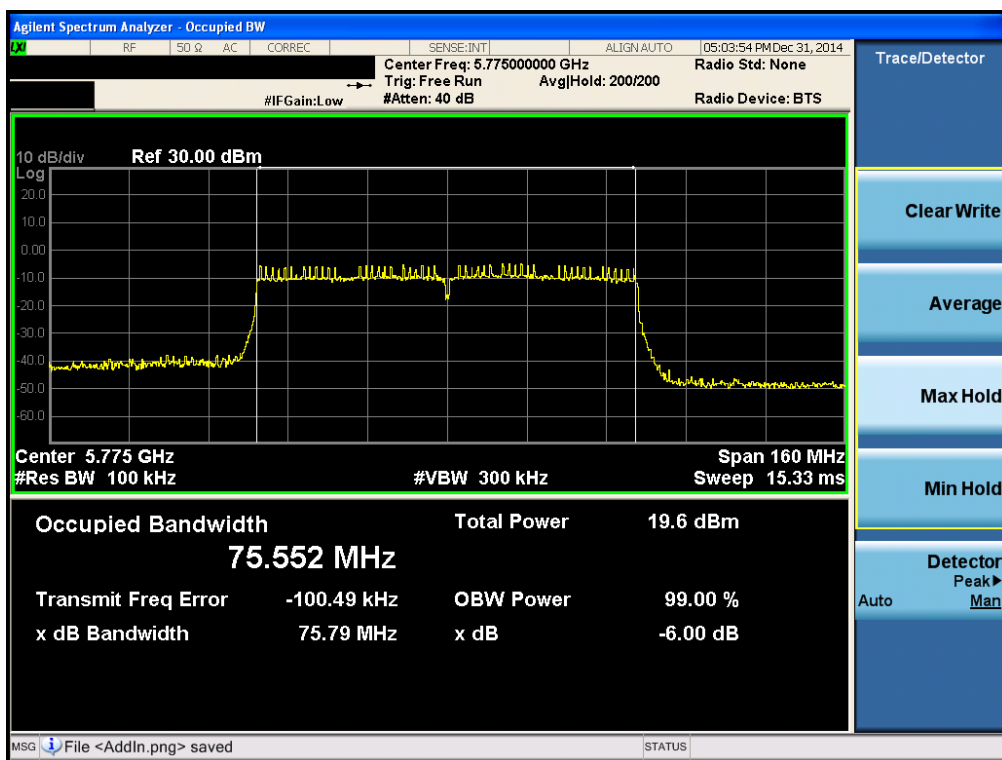
6 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.155 & ANT 1



6 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.155 & ANT 2



8.3 Maximum Conducted Output Power

■ 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 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.

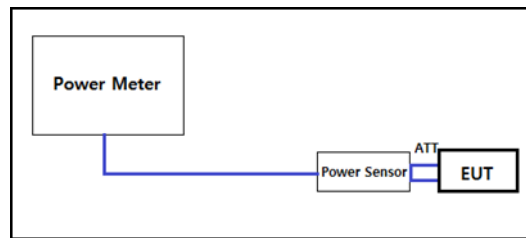
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater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

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Directional Gain (worst case) [dBi]	Determined Limit [dBm]
U-NII 1	802.11a	250	23.97	5.362	23.97
	802.11n HT20	250	23.97		23.97
	802.11n HT40	250	23.97		23.97
	802.11ac VHT80	250	23.97		23.97

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Directional Gain (worst case) [dBi]	Determined Limit [dBm]
U-NII 3	802.11a	1000	30.00	5.420	30.00
	802.11n HT20	1000	30.00		30.00
	802.11n HT40	1000	30.00		30.00
	802.11ac VHT80	1000	30.00		30.00

■ 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	CH	Freq. [MHz]	Test Result [dBm]	
			ANT 1	ANT 2
802.11a (Single Transmit)	36	5180	14.429	-
	40	5200	14.296	-
	48	5240	14.296	-
	52	5260	14.101	-
	60	5300	14.099	-
	64	5320	13.408	-
	100	5500	13.711	-
	116	5580	13.827	-
	140	5700	13.546	-
	149	5745	13.525	-
	157	5785	13.662	-
	165	5825	12.733	-

Mode	CH	Freq. [MHz]	Test Result [dBm]		
			ANT 1	ANT 2	SUM(ANT 1 + 2)
802.11n HT20 (Single Transmit)	36	5180	13.485	13.477	-
	40	5200	14.188	14.108	-
	48	5240	14.139	14.086	-
	52	5260	14.147	14.067	-
	60	5300	13.172	13.108	-
	64	5320	12.376	12.292	-
	100	5500	12.537	12.506	-
	116	5580	13.551	13.563	-
	140	5700	13.596	13.492	-
	149	5745	13.947	13.830	-
	157	5785	13.945	13.890	-
	165	5825	13.977	13.884	-
802.11n HT20 (Multiple Transmit)	36	5180	9.618	9.560	12.599
	40	5200	10.285	10.166	13.236
	48	5240	10.217	10.140	13.189
	52	5260	10.209	10.136	13.183
	60	5300	9.253	9.206	12.240
	64	5320	8.504	8.420	11.473
	100	5500	8.605	8.553	11.589
	116	5580	9.653	9.605	12.639
	140	5700	9.784	9.701	12.753
	149	5745	9.836	9.776	12.816
	157	5785	9.845	9.764	12.815
	165	5825	9.865	9.805	12.845
802.11n HT40 (Single Transmit)	38	5190	8.077	8.008	-
	46	5230	13.371	13.317	-
	54	5270	14.391	14.341	-
	62	5310	10.875	10.884	-
	102	5510	10.675	10.508	-
	110	5550	13.956	13.771	-
	134	5670	14.146	14.083	-
	151	5755	13.581	13.522	-
	159	5795	13.551	13.485	-
802.11n HT40 (Multiple Transmit)	38	5190	4.192	4.096	7.155
	46	5230	9.489	9.399	12.455
	54	5270	10.539	10.409	13.485
	62	5310	6.999	6.889	9.955
	102	5510	6.754	6.606	9.691
	110	5550	10.040	9.961	13.011
	134	5670	10.197	10.185	13.201
	151	5755	9.470	9.392	12.441
	159	5795	9.482	9.396	12.450

Mode	CH	Freq. [MHz]	Test Result [dBm]		
			ANT 1	ANT 2	SUM(ANT 1 + 2)
802.11ac VHT20 (Single Transmit)	36	5180	13.417	13.312	-
	40	5200	14.066	13.936	-
	48	5240	14.006	13.858	-
	52	5260	13.953	13.916	-
	60	5300	13.081	12.994	-
	64	5320	12.274	12.163	-
	100	5500	12.341	12.344	-
	116	5580	13.517	13.441	-
	140	5700	13.517	13.441	-
	149	5745	13.751	13.744	-
	157	5785	13.800	13.781	-
	165	5825	13.855	13.844	-
802.11ac VHT20 (Multiple Transmit)	36	5180	9.498	9.374	12.447
	40	5200	10.159	10.021	13.101
	48	5240	10.115	10.060	13.098
	52	5260	10.096	10.066	13.091
	60	5300	9.183	9.034	12.119
	64	5320	8.335	8.267	11.311
	100	5500	8.466	8.474	11.480
	116	5580	9.559	9.520	12.550
	140	5700	9.588	9.539	12.574
	149	5745	9.711	9.679	12.705
	157	5785	9.704	9.630	12.677
	165	5825	9.720	9.660	12.700
802.11ac VHT40 (Single Transmit)	38	5190	7.930	7.826	-
	46	5230	13.280	13.204	-
	54	5270	14.328	14.186	-
	62	5310	10.774	10.707	-
	102	5510	10.542	10.405	-
	110	5550	13.794	13.687	-
	134	5670	13.995	13.925	-
	151	5755	13.498	13.338	-
	159	5795	13.477	13.405	-
802.11ac VHT40 (Multiple Transmit)	38	5190	4.072	3.956	7.025
	46	5230	9.344	9.246	12.306
	54	5270	10.315	10.248	13.292
	62	5310	6.839	6.783	9.821
	102	5510	6.599	6.504	9.562
	110	5550	9.931	9.870	12.911
	134	5670	10.119	9.991	13.066
	151	5755	9.337	9.306	12.332
	159	5795	9.347	9.297	12.332
802.11ac VHT80 (Single Transmit)	42	5210	8.380	8.237	-
	58	5290	9.940	9.853	-
	106	5530	10.129	10.102	-
	155	5775	12.537	12.485	-
802.11ac VHT80 (Multiple Transmit)	42	5210	4.424	4.407	7.426
	58	5290	6.094	5.992	9.054
	106	5530	6.272	6.135	9.214
	155	5775	8.480	8.399	11.450