

RF TEST REPORT

Test item : Wi-Fi Transmitter
Model No. : WDG720M
Order No. : DEMC1402-00360
Date of receipt : 2014-02-03
Test duration : 2014-03-03 ~ 2014-04-12
Date of issue : 2014-06-23
Use of report : FCC & IC Original Grant

Applicant : Samsung Electronics Co Ltd
19 Chapin Rd., Building D, Pine Brook, New Jersey, United States, 07058

Test laboratory : Digital EMC Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
449-935

Test specification : FCC Part 15.407 Subpart E
RSS-210 Issue 8: 2010

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 Digital EMC Co., Ltd.

Tested by:

Witnessed by:

Reviewed by:



Engineer
HyunSu Son



Deputy General Manager
WonJung Lee

Test Report Version

Test Report No.	Date	Description
DRTFCC1406-0725	Jun. 3, 2014	Initial issue
DRTFCC1406-0725(1)	Jun. 23, 2014	Remove test result(test item : Peak Excursion)

CONTENTS

1. EUT DESCRIPTION	4
2. INFORMATION ABOUT TESTING	5
2.1 Test mode	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
3. SUMMARY OF TESTS	7
4. TEST METHODOLOGY	8
4.1 EUT configuration	8
4.2 EUT exercise	8
4.3 General test procedures	8
4.4 Description of test modes	8
5. INSTRUMENT CALIBRATION	9
6. FACILITIES AND ACCREDITATIONS	9
6.1 Facilities	9
6.2 Equipment	9
7. ANTENNA REQUIREMENTS	9
8. TEST RESULT	10
8.1 Emission Bandwidth(26 dB Bandwidth)	10
8.2 Maximum Conducted Output Power	44
8.3 Peak Power Spectral Density	46
8.4 Frequency Stability	80
8.5 Radiated Spurious Emission Measurements	81
8.6 AC Conducted Emissions	93
8.7 Occupied Bandwidth	100
9. LIST OF TEST EQUIPMENT	133
APPENDIX I	134

1.EUTDESCRIPTION

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
Product	Wi-Fi Transmitter
Model Name	WDG720M
Add Model Name	N/A
Power Supply	DC 5 V
Frequency Range	<p>Band I(5150 ~ 5250MHz)</p> <ul style="list-style-type: none"> ▪802.11a/n(HT20): 5180 ~ 5240 MHz ▪802.11n(HT40):5190 ~ 5230MHz <p>Band II(5250 ~ 5350MHz)</p> <ul style="list-style-type: none"> ▪ 802.11a/n(HT20): 5260 ~ 5320MHz ▪ 802.11n(HT40):5270 ~ 5310MHz <p>Band III(5470 ~ 5725MHz)</p> <ul style="list-style-type: none"> ▪ 802.11a/n(HT20): 5500 ~ 5700MHz ▪ 802.11n(HT40):5510 ~ 5670 MHz
Modulation type	256QAM, 64QAM, 16QAM, QPSK BPSK for OFDM
Transmissions category	Completely uncorrelated signal
Antenna Specification	<p>Antenna type: Internal Antenna</p> <p>Antenna gain</p> <ul style="list-style-type: none"> ▪Band I: ANT 1 : 0.560dBi& ANT 2 : 2.130dBi ▪Band II: ANT 1 : 1.470dBi& ANT 2 : 2.370dBi ▪Band III: ANT 1 : 2.480dBi& ANT 2 : 1.830dBi <p>Antenna configuration</p> <ul style="list-style-type: none"> ▪802.11a: Single Transmitting (ANT 1 or ANT 2) ▪ 802.11n(MCS0 ~ 7) : Single Transmitting (ANT 1 or ANT 2) ▪ 802.11n(MCS8 ~ 15): Multiple Transmitting(ANT 1 and ANT 2)

2. INFORMATION ABOUT TESTING

2.1 Test mode

5GHz Band	Mode	Worst data rate
Band I	802.11a	54Mbps
	802.11n(HT20)	MCS 7
	802.11n(HT40)	MCS 7
Band II	802.11a	54 Mbps
	802.11n(HT20)	MCS 7
	802.11n(HT40)	MCS 7
Band III	802.11a	54Mbps
	802.11n(HT20)	MCS 7
	802.11n(HT40)	MCS 7

The worst case data rate for each modulation is determined as above test mode. 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)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
Band I	36	5180	38	5190
	40	5200	-	-
	48	5240	46	5230
Band II	52	5260	54	5270
	60	5300	-	-
	64	5320	62	5310
Band III	100	5500	102	5510
	116	5580	110	5550
	140	5700	134	5670

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Laptop	Satellite L510	3A033073Q	Toshiba	FCC DoC
-	-	-	-	-

2.4 Tested environment

Temperature	: 21°C ~ 24°C
Relative humidity content	: 40 % ~ 44 % R.H.
Details of power supply	: DC5 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 Section(s)	Parameter	Limit	Test Condition	Status <small>Note 1</small>
I. Transmitter Mode (TX)					
15.407(a)	N/A	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C
15.407(a)	RSS-210 [A9.2]	Maximum Conducted Output Power	5150 ~ 5250MHz For FCC 50mW or $<4 + 10\log_{10}(B)$ dBm, whichever power is less. 5150 ~ 5250MHz For IC 200mW or $<10 + 10\log_{10}(B)$ dBm, whichever power is less. 5250 ~ 5350MHz For FCC & IC 250mW or $<11 + 10\log_{10}(B)$ dBm, whichever power is less. 5470 ~ 5725MHz For FCC & IC 250mW or $<11 + 10\log_{10}(B)$ dBm, whichever power is less.		C
15.407(a)	RSS-210 [A9.2]	Peak Power Spectral Density	5150 ~ 5250MHz For FCC: 4dBm/MHz 5150 ~ 5250MHz For IC: 10dBm/MHz 5250 ~ 5350MHz For FCC & IC: 11dBm/MHz 5470 ~ 5725MHz For FCC & IC: 11dBm/MHz		C
15.407(g)	N/A	Frequency Stability	N/A		C
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	N/A		C
15.407(b)	RSS-210 [A9.2]	Undesirable Emissions	< -27 dBm/MHz EIRP	Radiated	C
15.205 15.209 15.407(b)	RSS-Gen [7.2.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		C <small>Note.3</small>
15.407(h)	RSS-210 [A9.3]	Dynamic Frequency Selection	See DFS test report	-	C <small>Note.4</small>
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	FCC 15.207	AC Line Conducted	C
15.203	RSS-Gen [7.1.2]	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 and ANSI C63.10.

Note 3: These test items were performed in each axis and the worst case data was reported.

Note 4: For DFS testing, please refer to DFS test report.

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB789033 D02 2014 v1. 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 Commission's 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 engineering 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 2014 v01. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10.

The EUT is placed on the turntable, 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. 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 as stated on KDB789033.

The EUT is placed on a turn 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 axes.

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 38, 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 [7.1.2]:

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 installed permanently on this module.(Please refer to the internal photo.)
 Therefore this module Complies with the requirement of §15.203**

7.2 Directional antenna gain for MIMO :

Bands	ANT1 [dBi]	ANT2 [dBi]	Directional Gain for uncorrelated signals [dBi]
Band I	0.560	2.130	1.416
Band II	1.470	2.370	1.943
Band III	2.480	1.830	2.167

Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})/N_{ANT}]$ dBi for MIMO uncorrelated signal

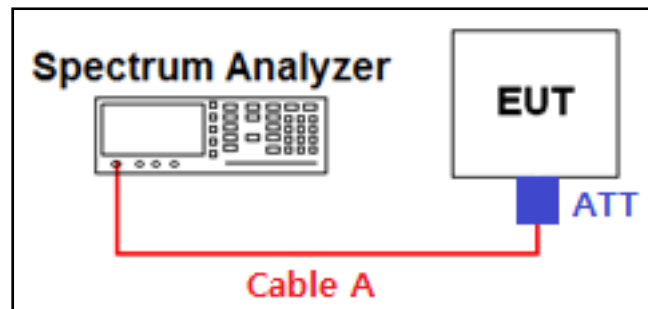
8. TEST RESULT

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 Configurations



■ 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**.
5. 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%.

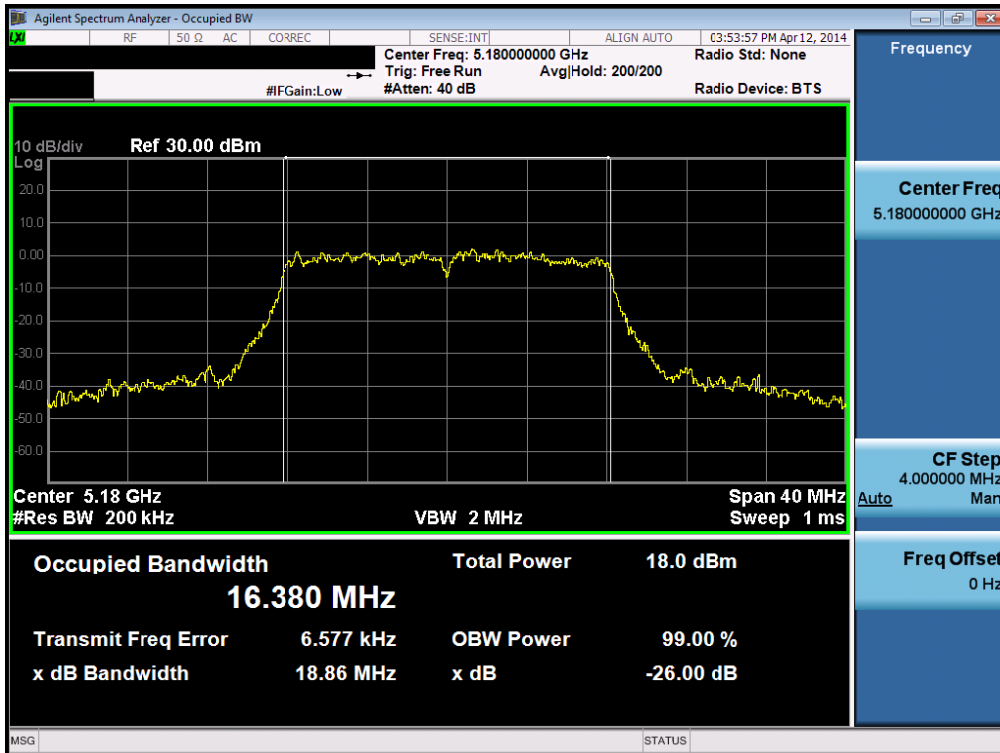
■ TEST RESULTS: **Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]	
				ANT 1	ANT 2
802.11a	Band I	36	5180	18.860	18.940
		40	5200	18.940	19.110
		48	5240	18.780	18.980
	Band II	52	5260	18.940	19.140
		60	5300	18.920	18.810
		64	5320	18.960	19.050
	Band III	100	5500	18.860	19.300
		116	5580	18.990	18.970
		140	5700	19.180	18.830
802.11n (HT20)	Band I	36	5180	19.300	19.470
		40	5200	19.470	19.290
		48	5240	19.330	19.470
	Band II	52	5260	19.610	19.350
		60	5300	19.490	19.400
		64	5320	19.340	19.430
	Band III	100	5500	19.540	19.390
		116	5580	19.560	19.410
		140	5700	19.630	19.390
802.11n (HT40)	Band I	38	5190	39.260	39.790
		46	5230	39.510	39.700
	Band II	54	5270	39.300	39.400
		62	5310	39.630	39.600
	Band III	102	5510	39.320	39.040
		110	5550	39.520	39.340
		134	5670	39.620	40.460

Result Plots

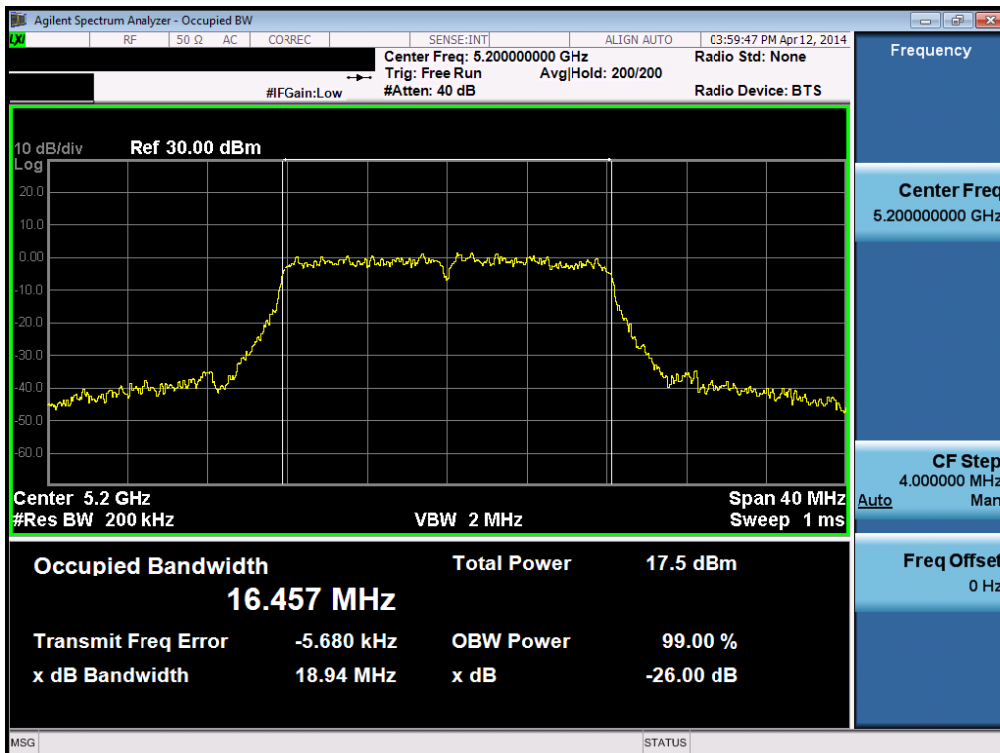
26 dB Bandwidth

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



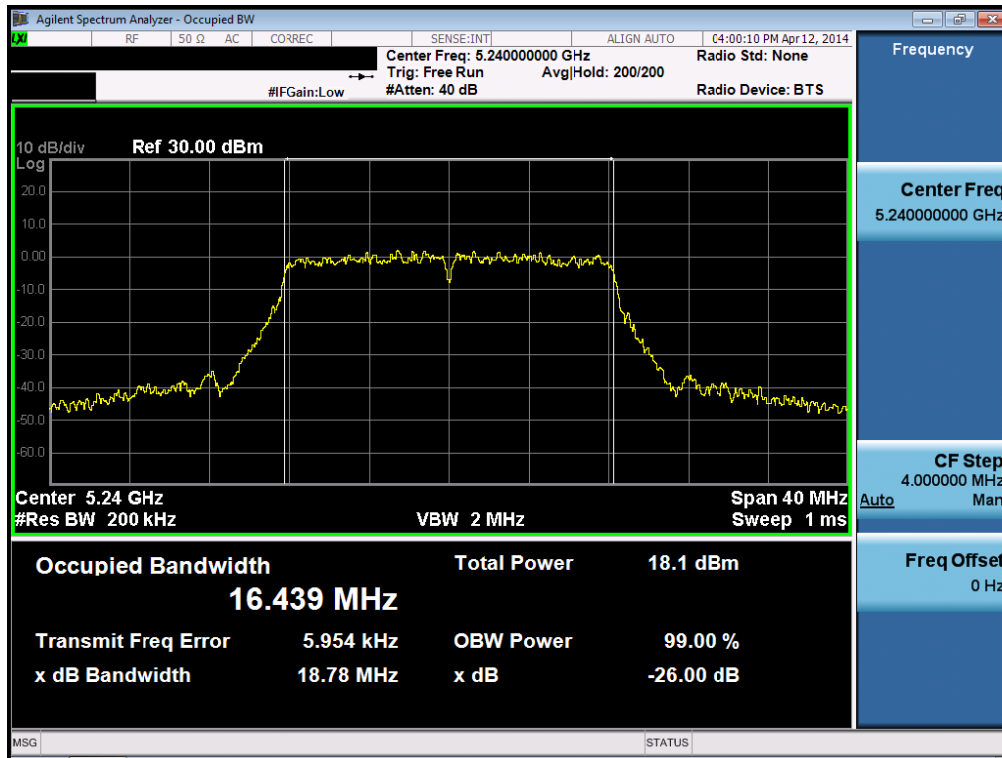
26 dB Bandwidth

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



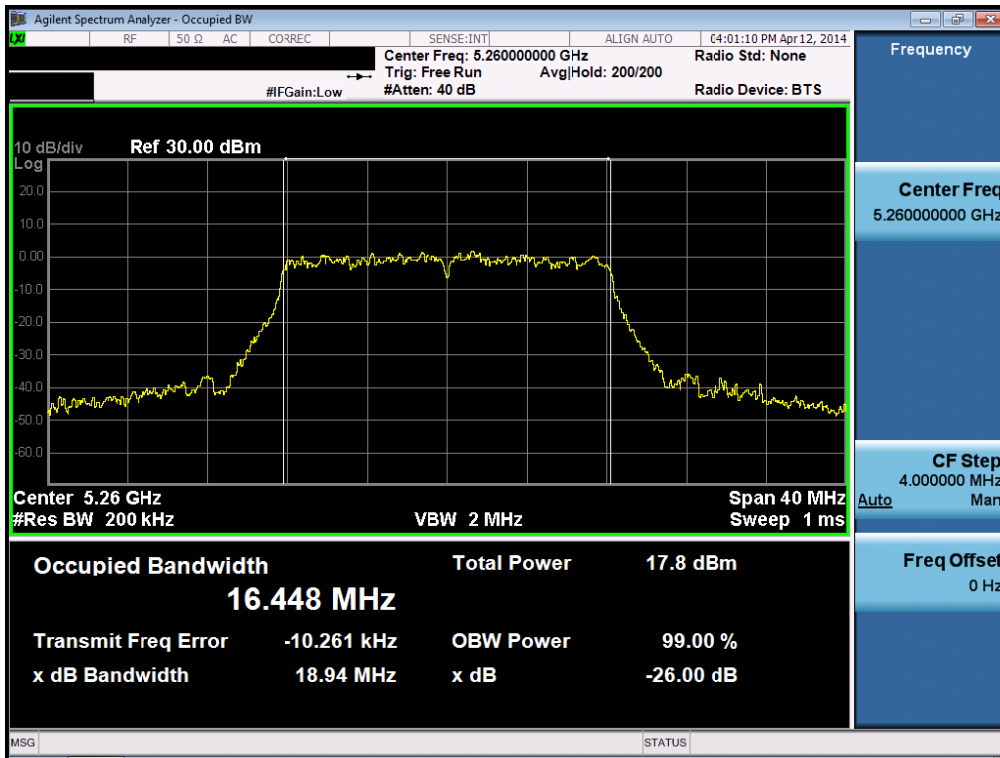
26 dB Bandwidth

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



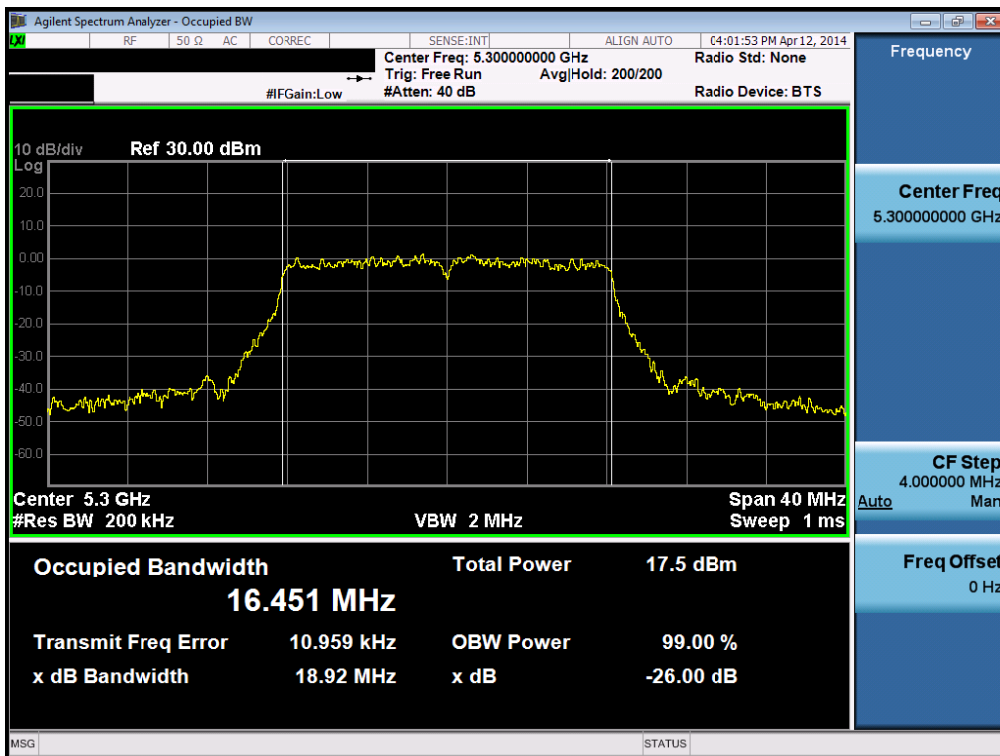
26 dB Bandwidth

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



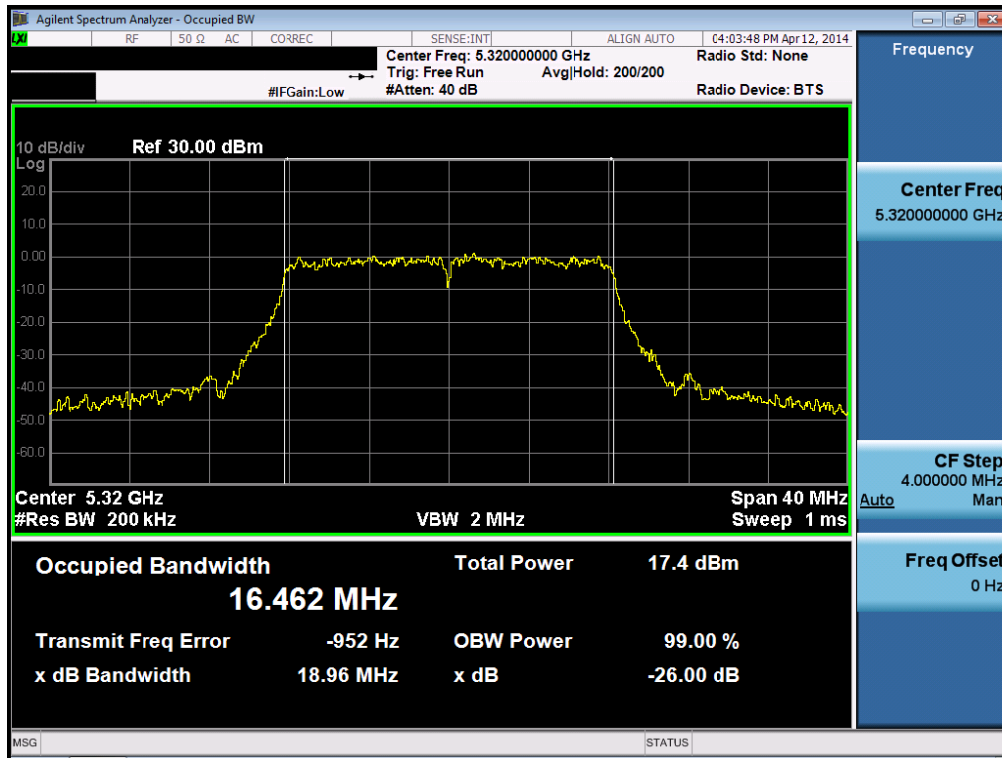
26 dB Bandwidth

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



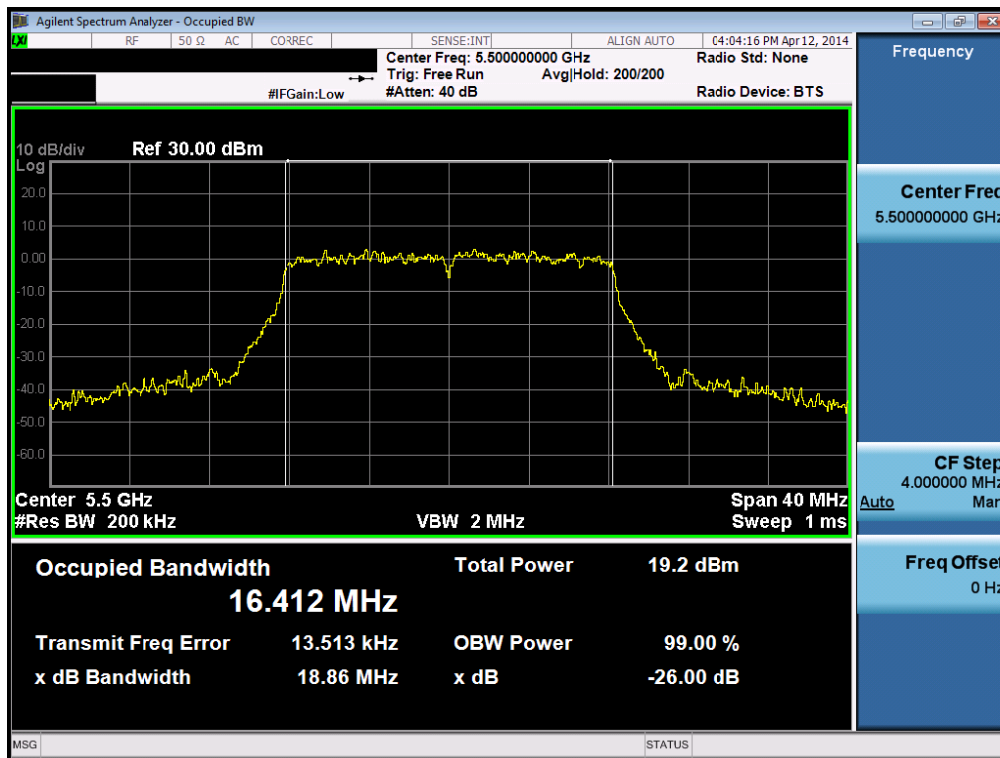
26 dB Bandwidth

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



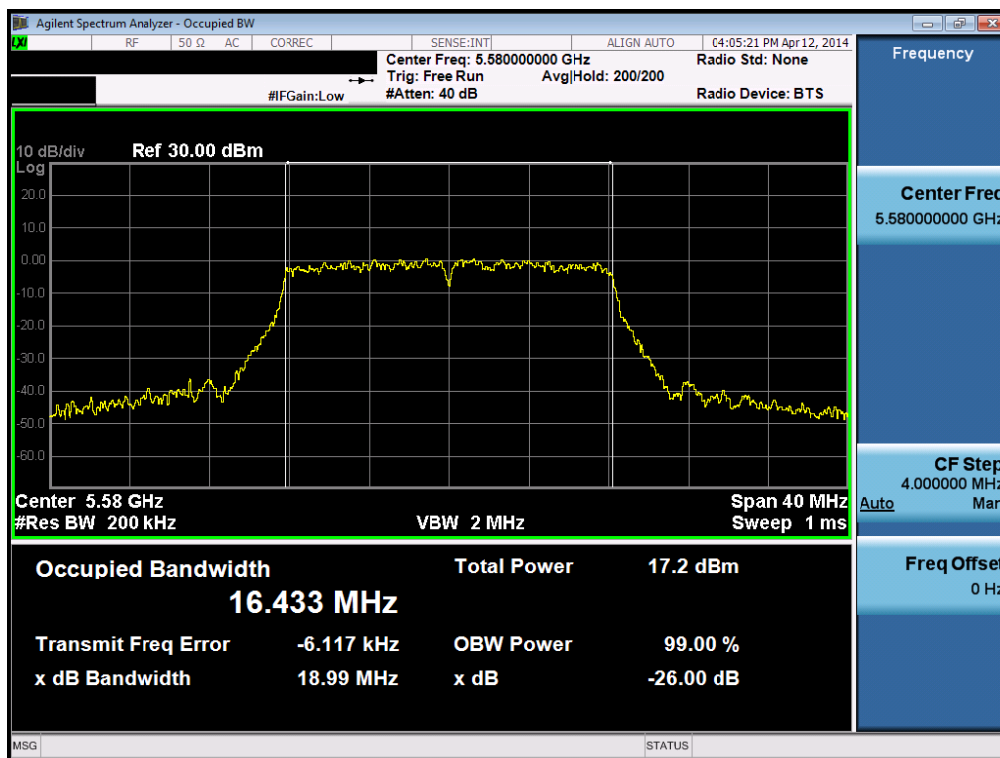
26 dB Bandwidth

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



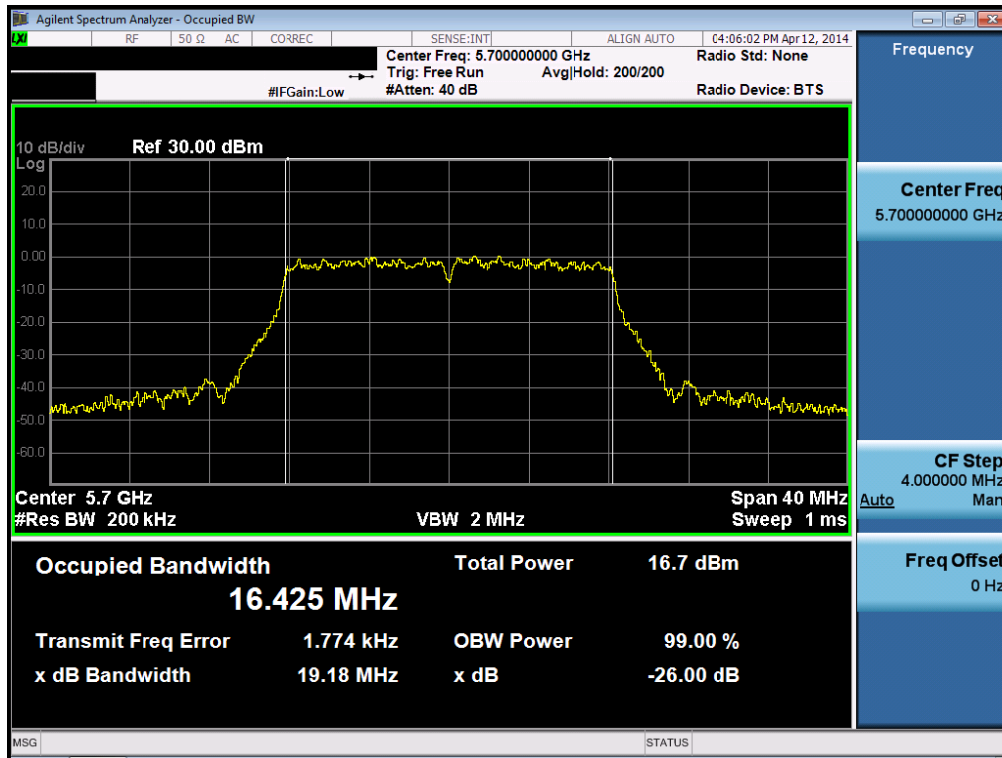
26 dB Bandwidth

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



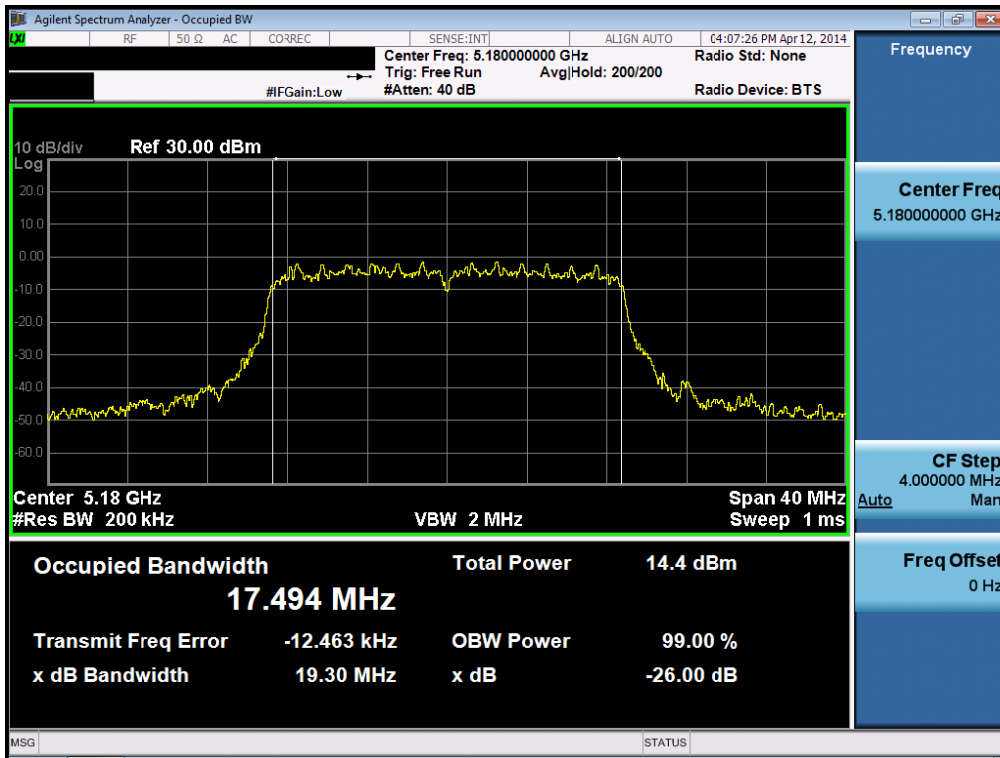
26 dB Bandwidth

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



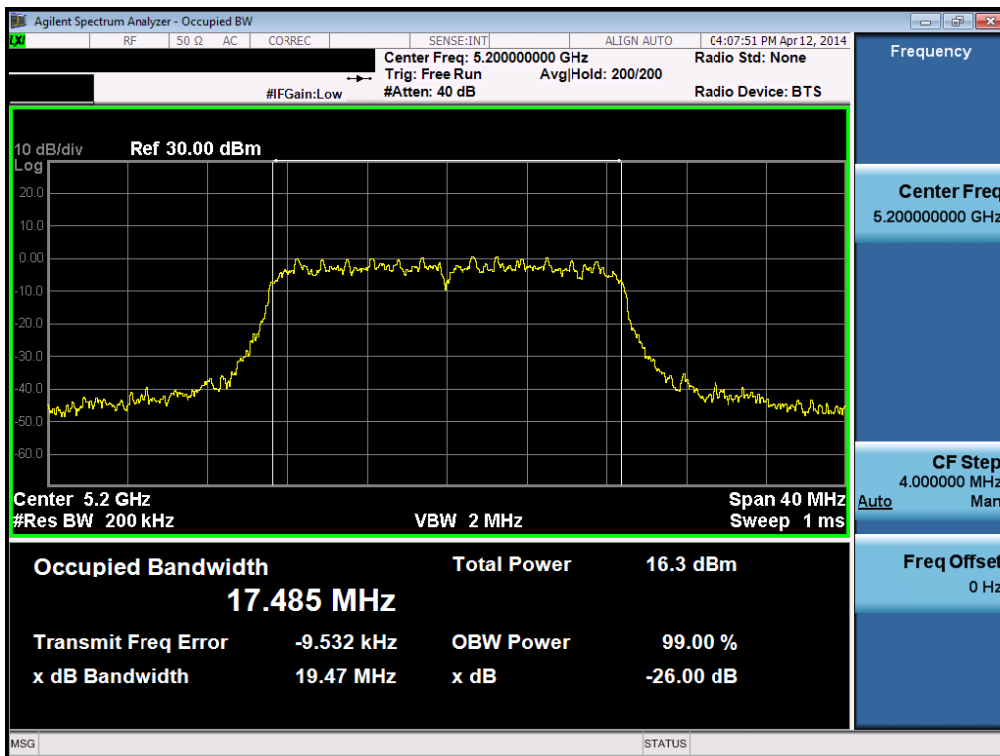
26 dB Bandwidth

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



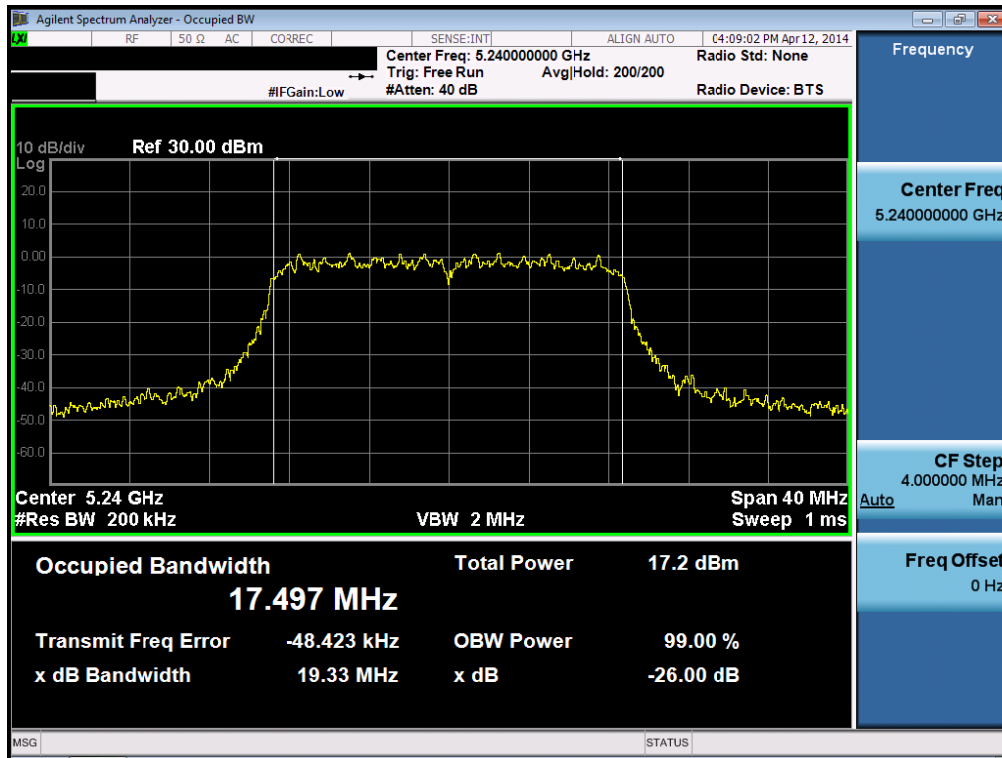
26 dB Bandwidth

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



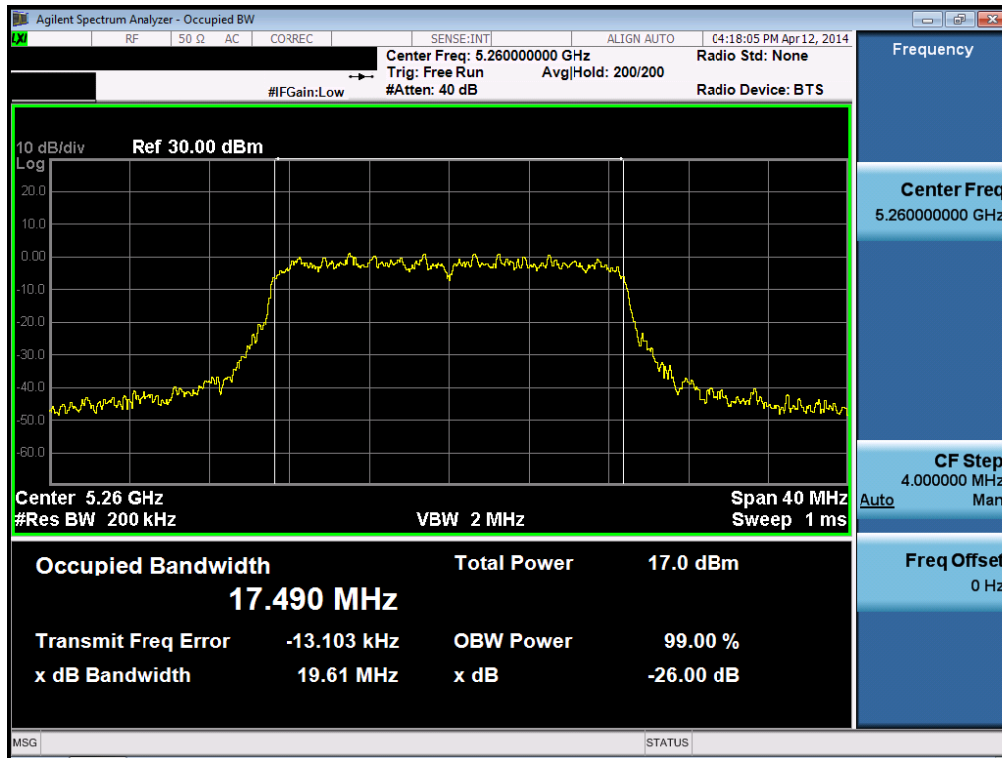
26 dB Bandwidth

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



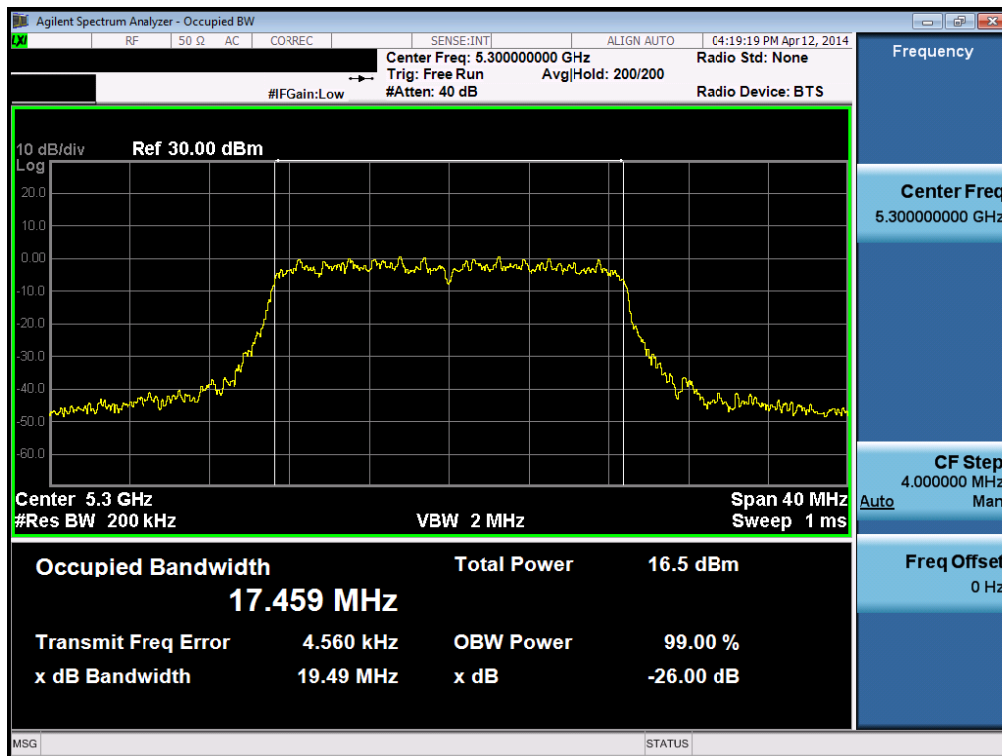
26 dB Bandwidth

Test Mode: ANT 1&802.11n HT20& Ch.52



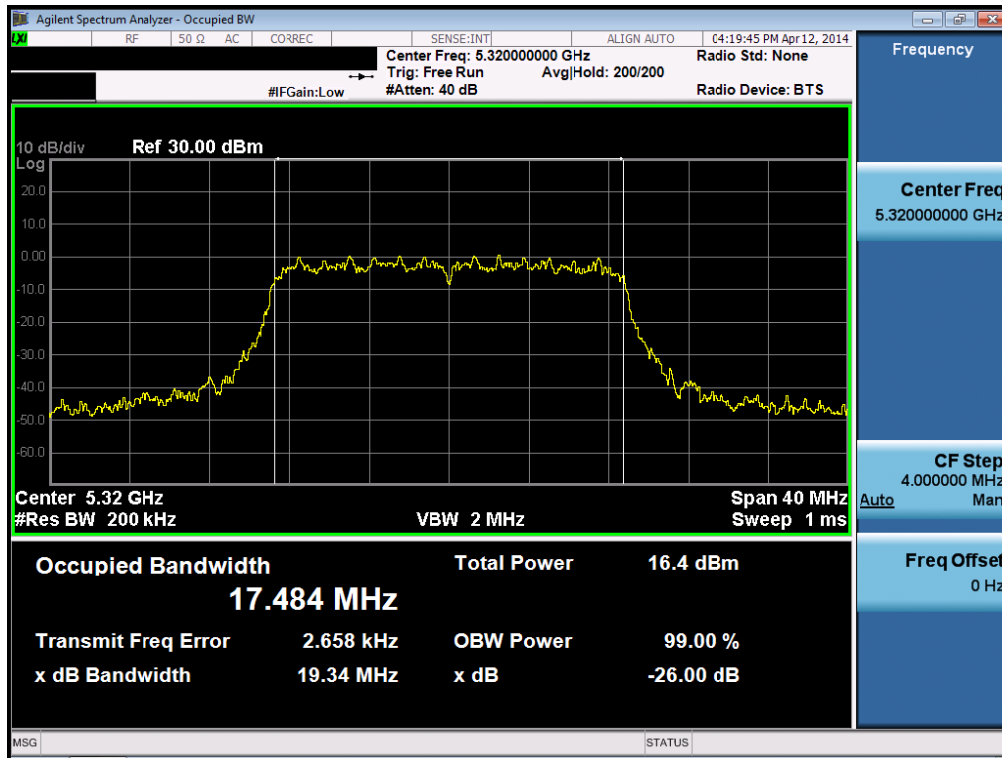
26 dB Bandwidth

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



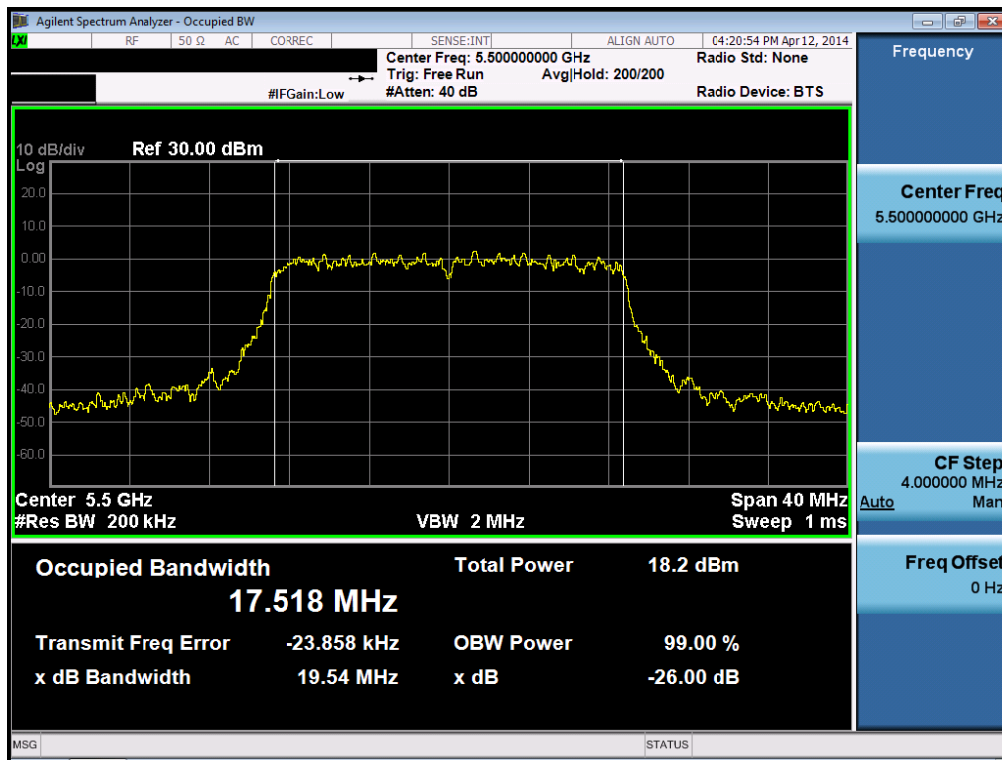
26 dB Bandwidth

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



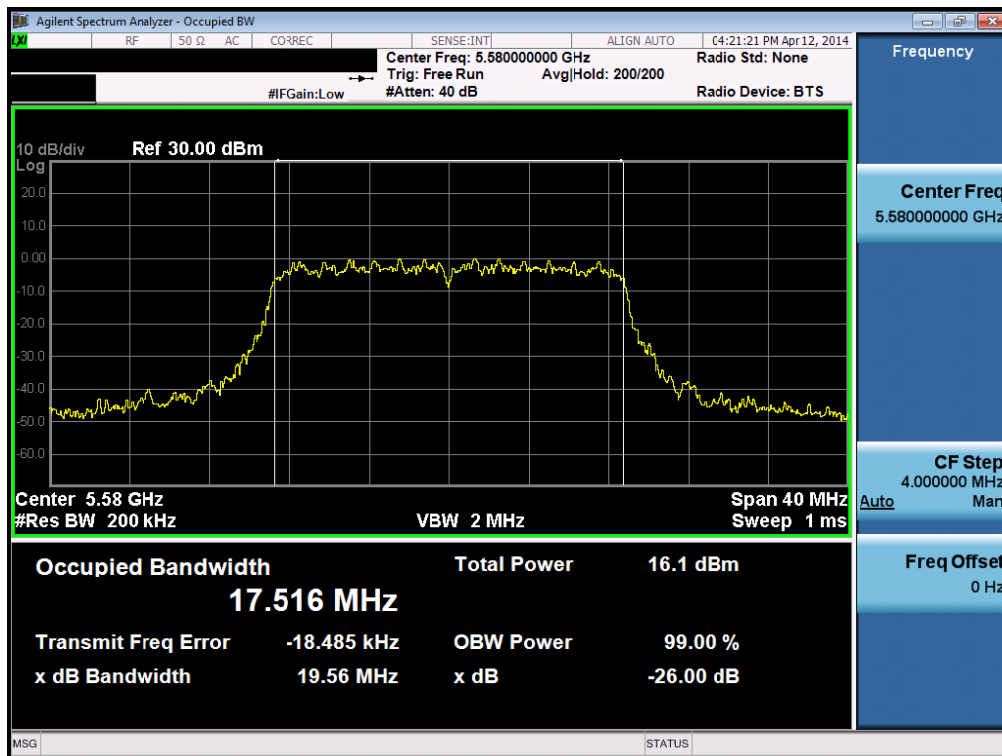
26 dB Bandwidth

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



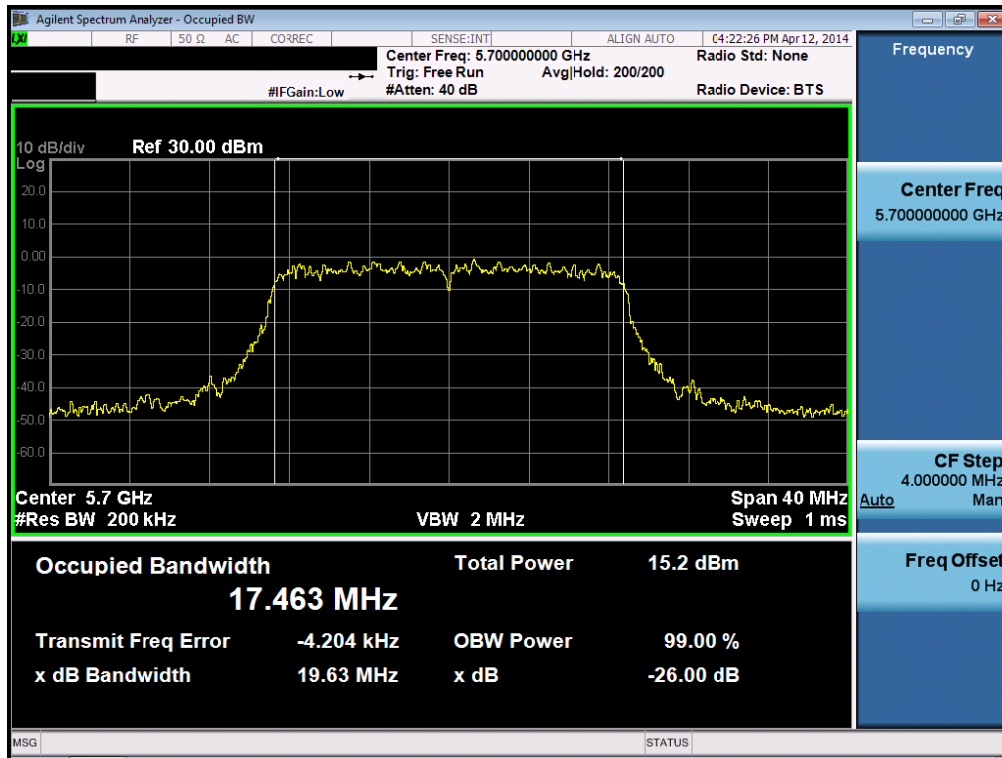
26 dB Bandwidth

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



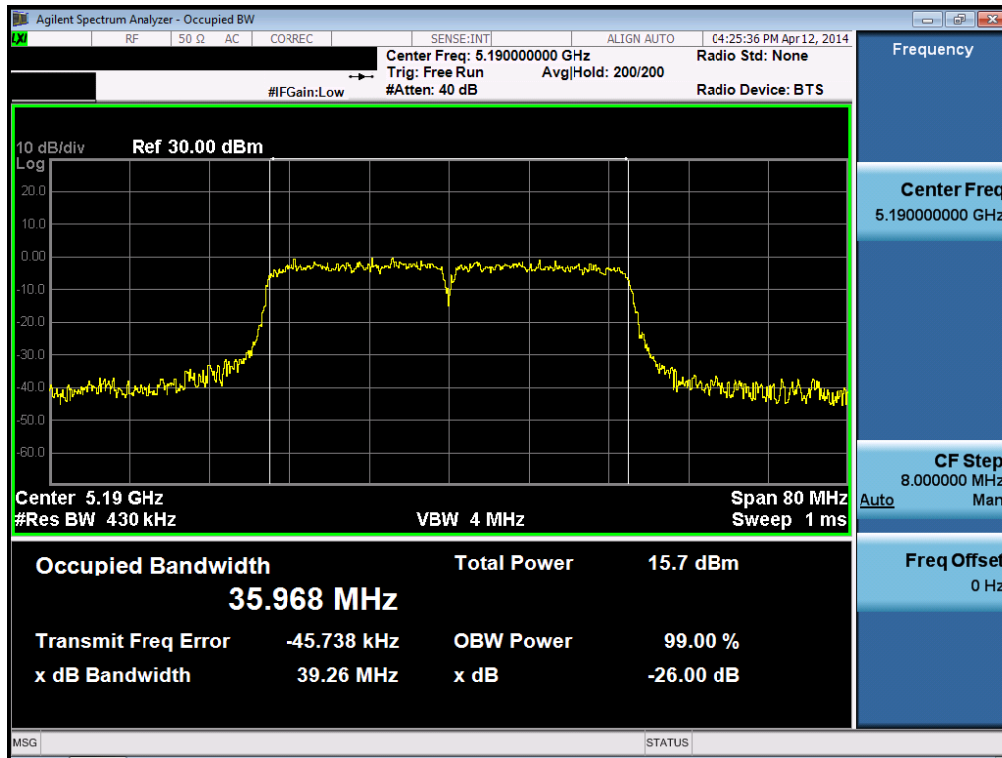
26 dB Bandwidth

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



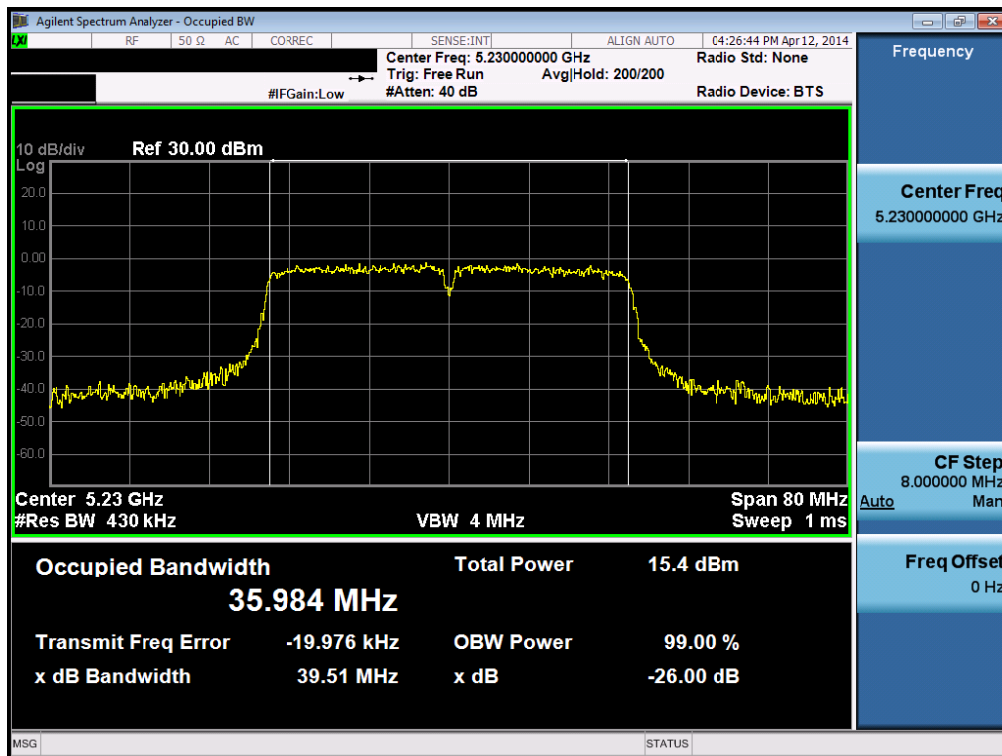
26 dB Bandwidth

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



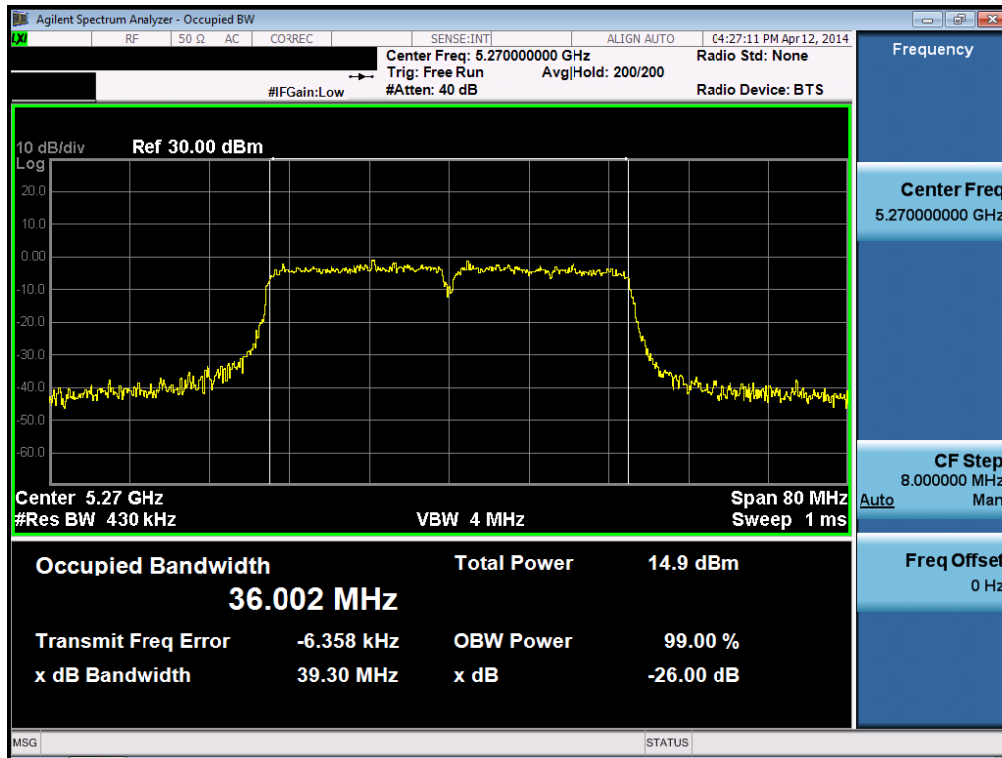
26 dB Bandwidth

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



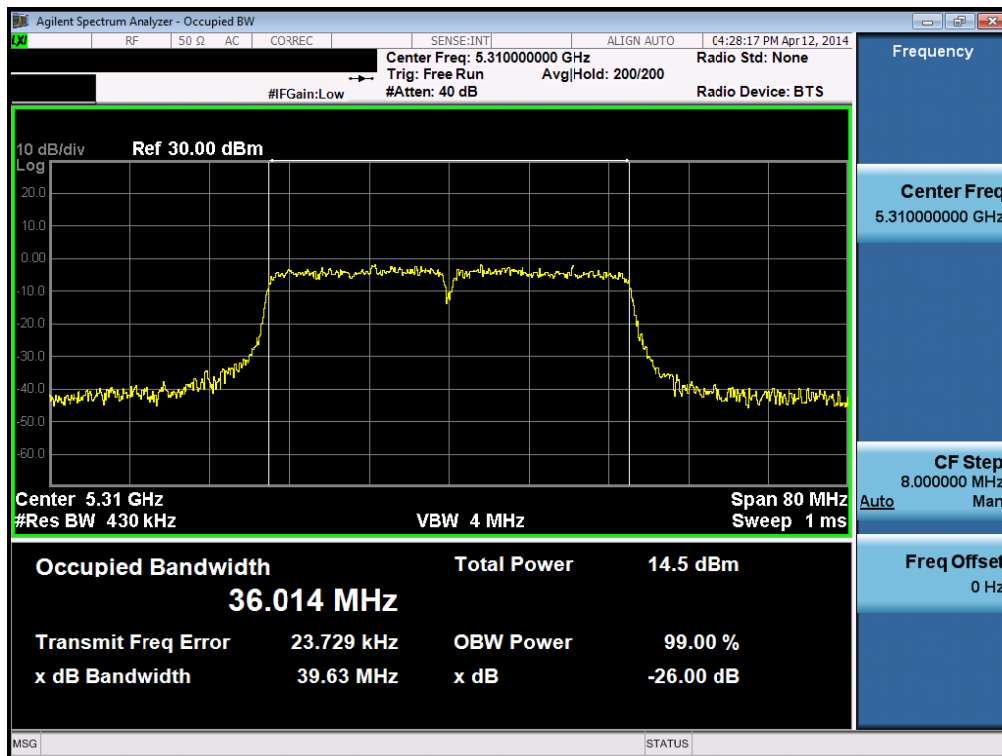
26 dB Bandwidth

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



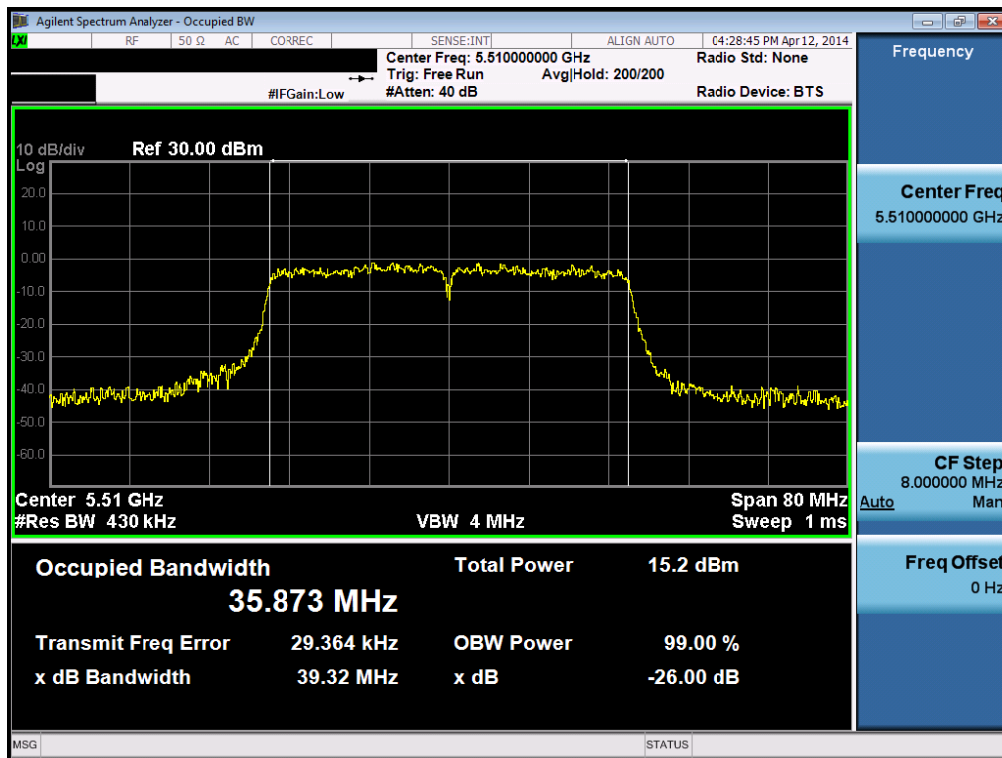
26 dB Bandwidth

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



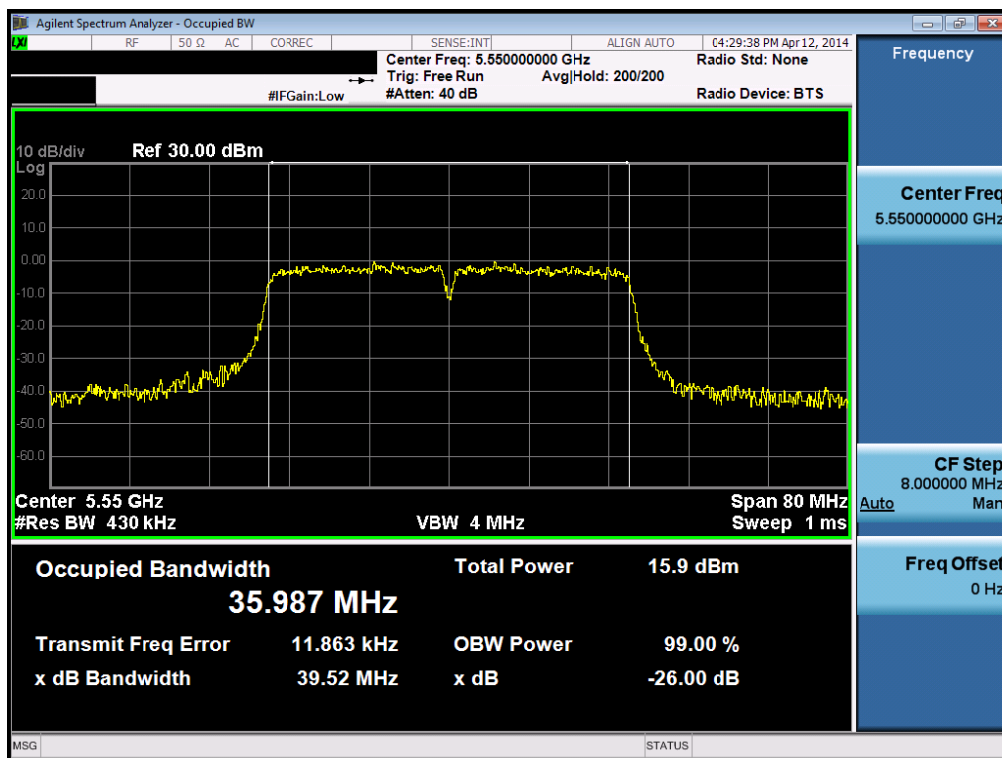
26 dB Bandwidth

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



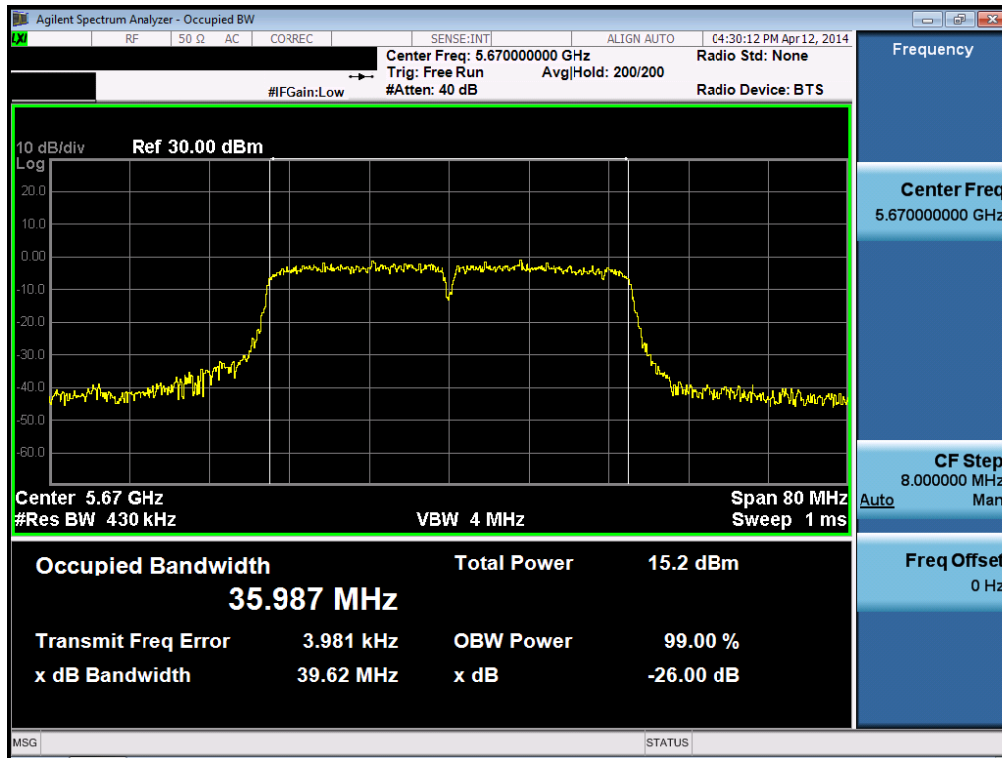
26 dB Bandwidth

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



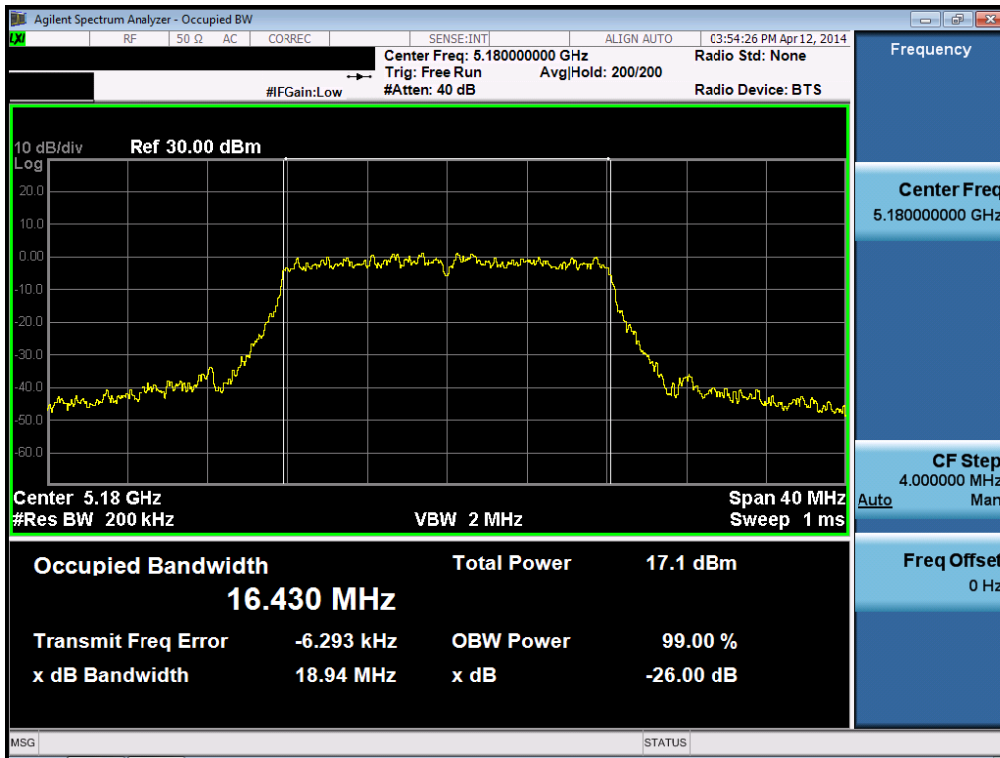
26 dB Bandwidth

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



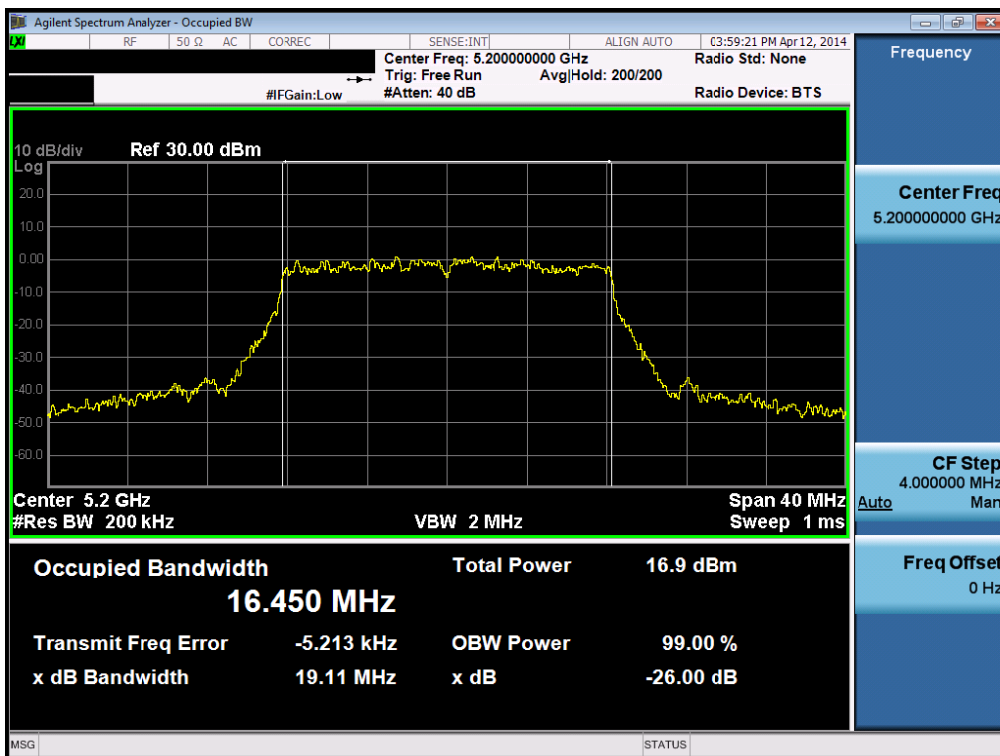
26 dB Bandwidth

Test Mode: ANT 2&802.11a & Ch.36



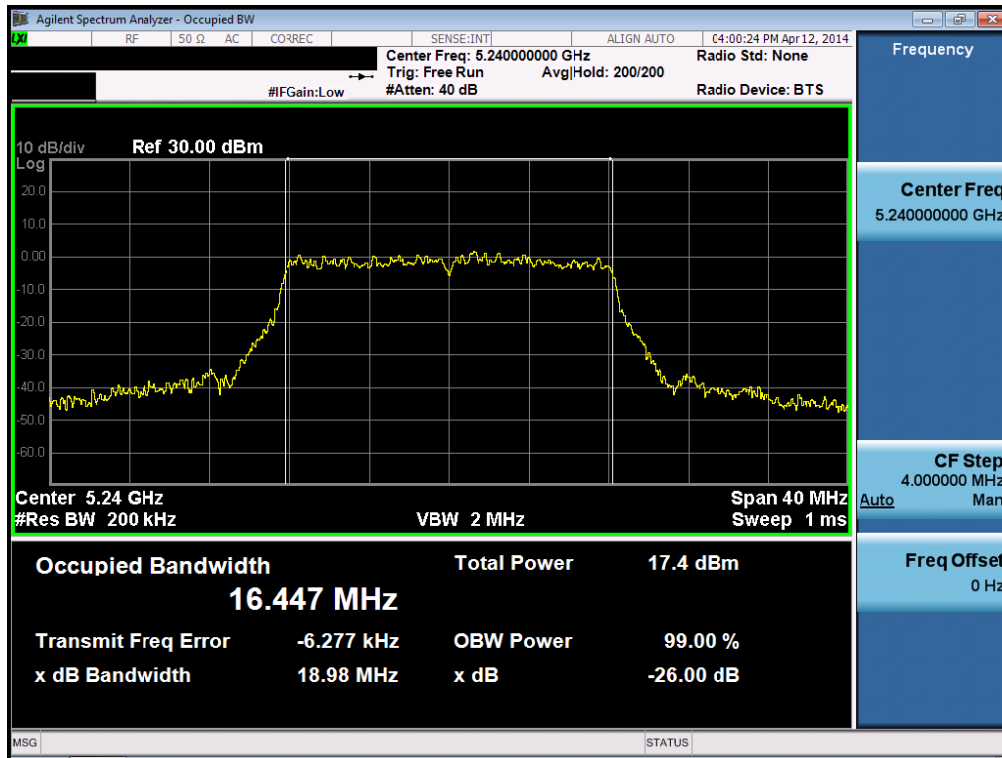
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.40



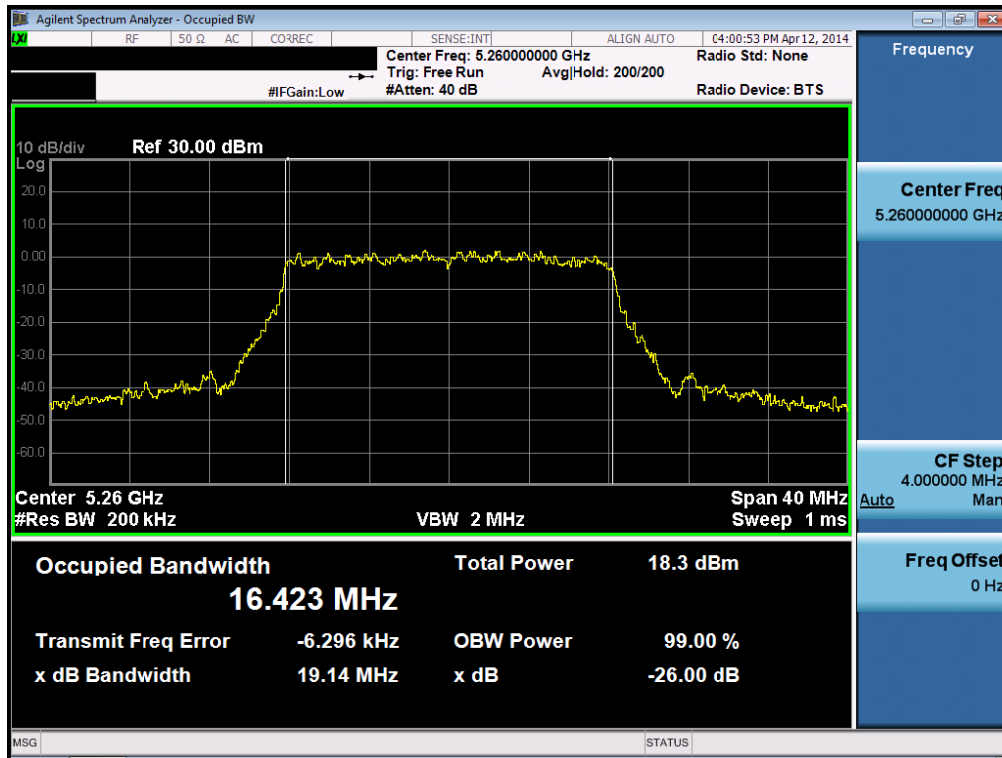
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.48



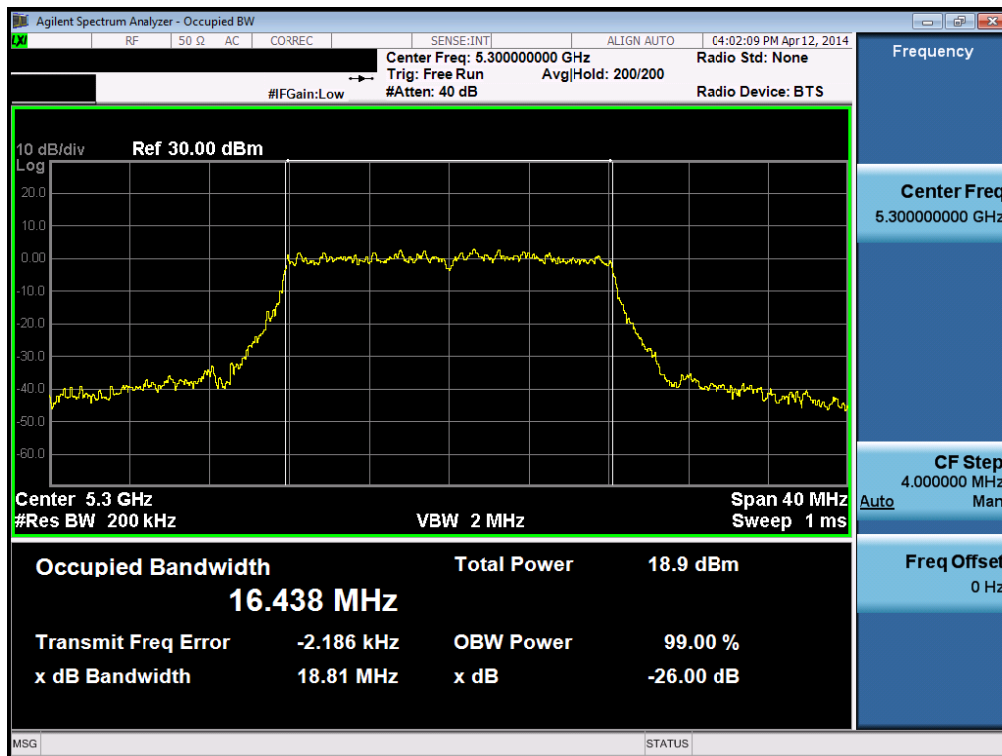
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.52



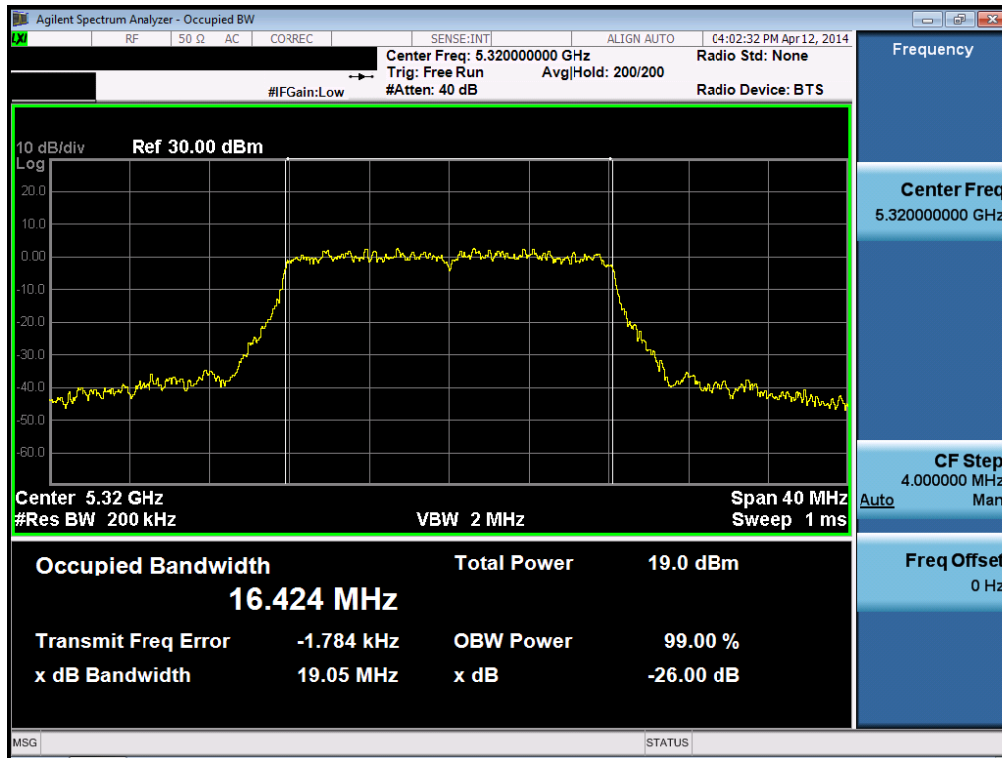
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.60



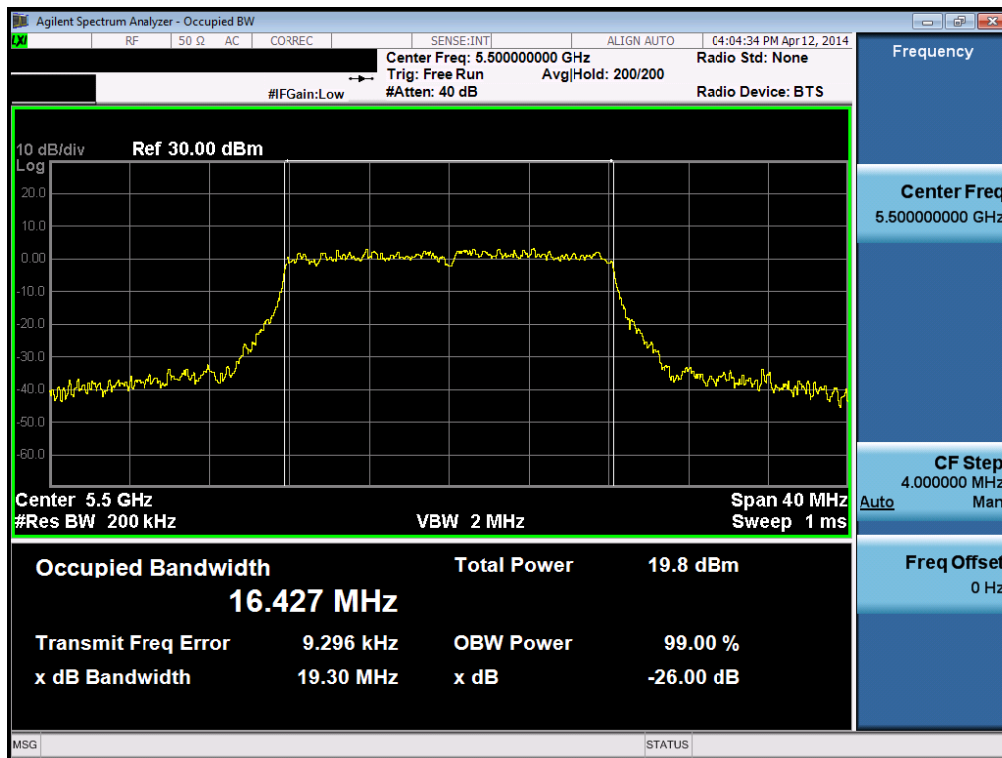
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.64



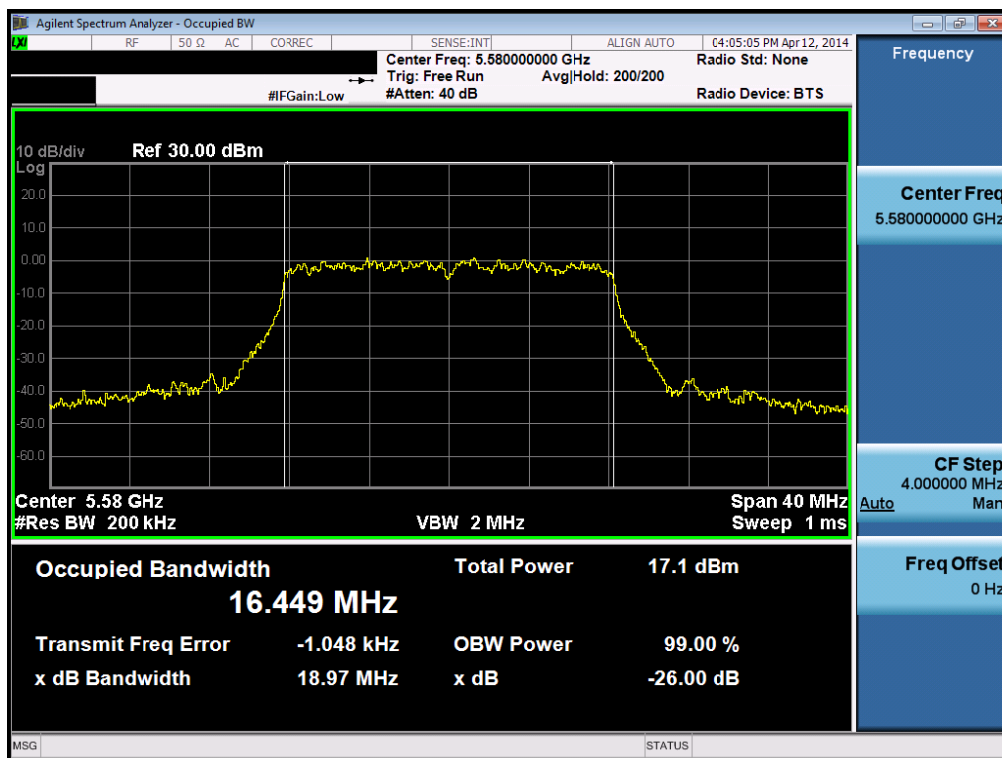
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.100



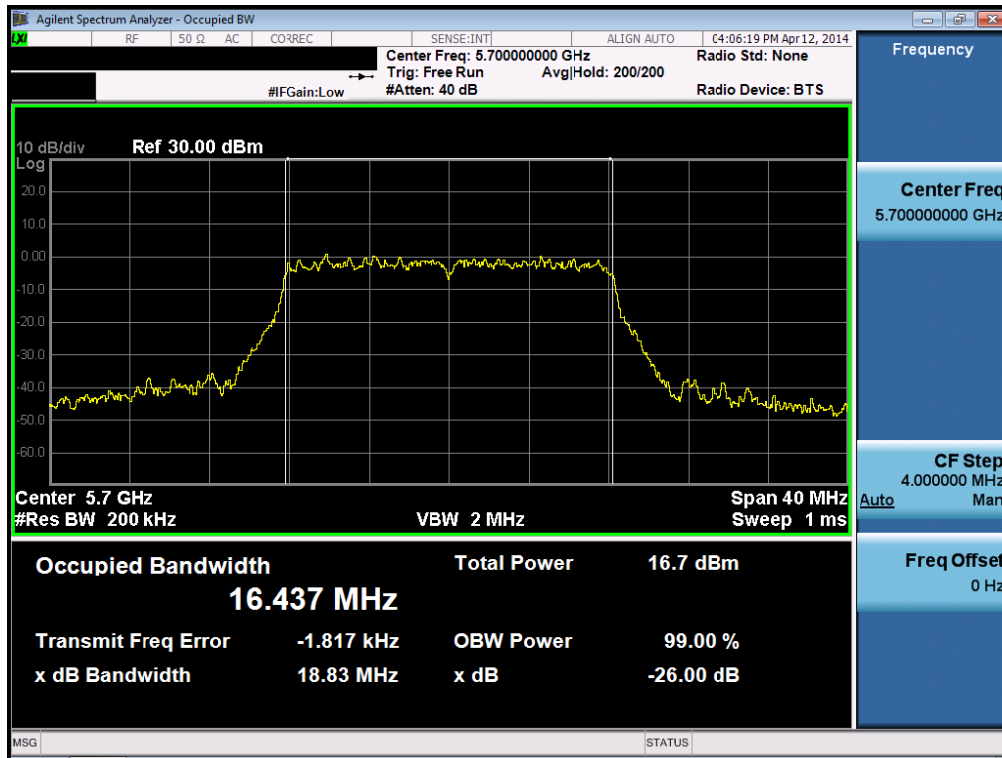
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.116



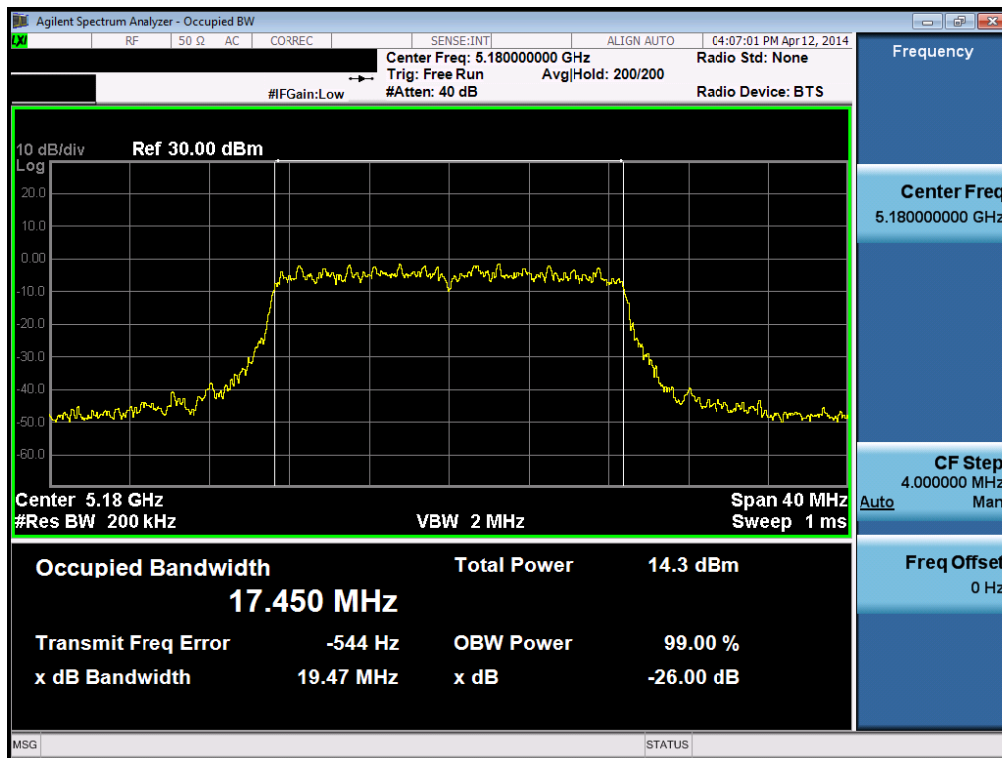
26 dB Bandwidth

Test Mode: ANT 2&802.11a& Ch.140



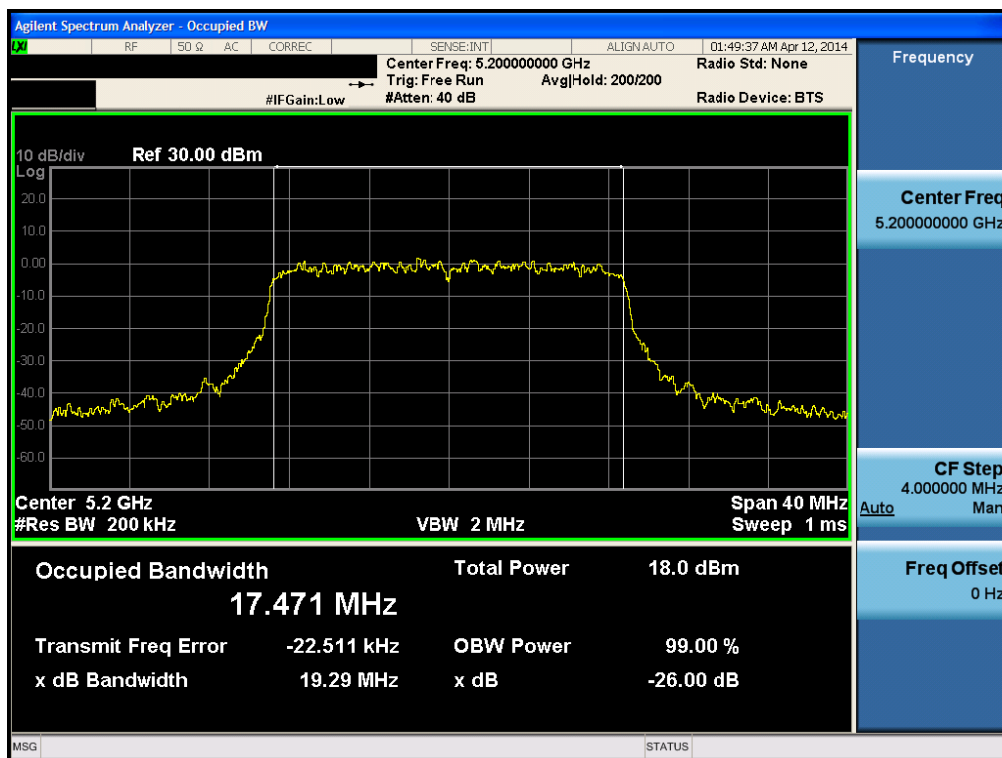
26 dB Bandwidth

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



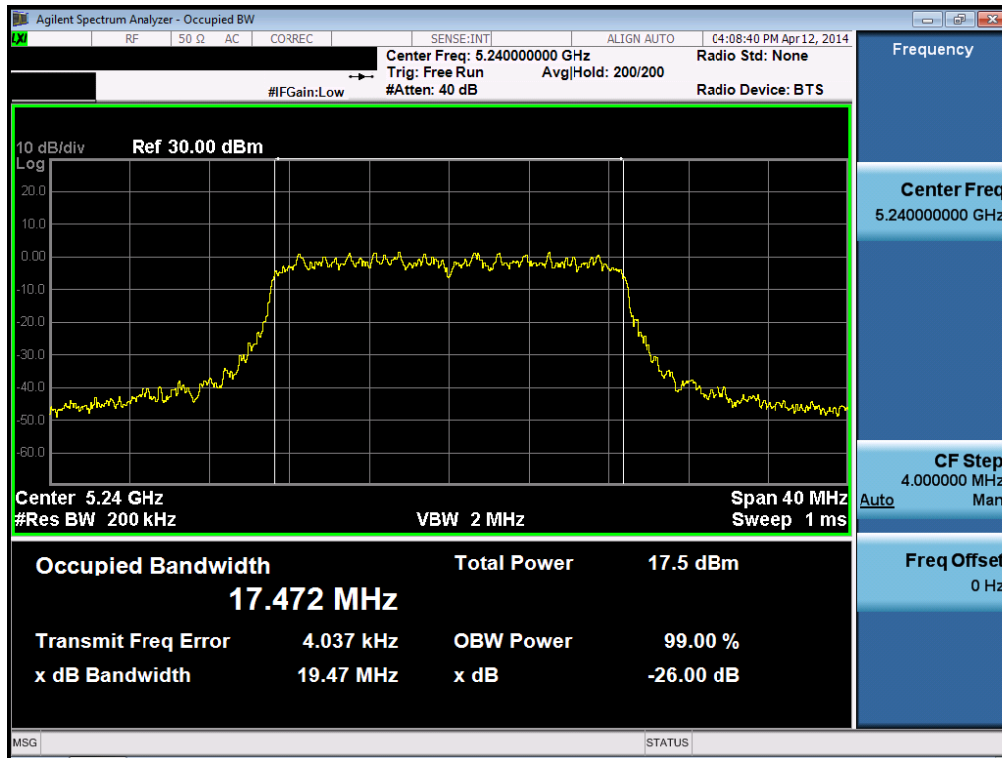
26 dB Bandwidth

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



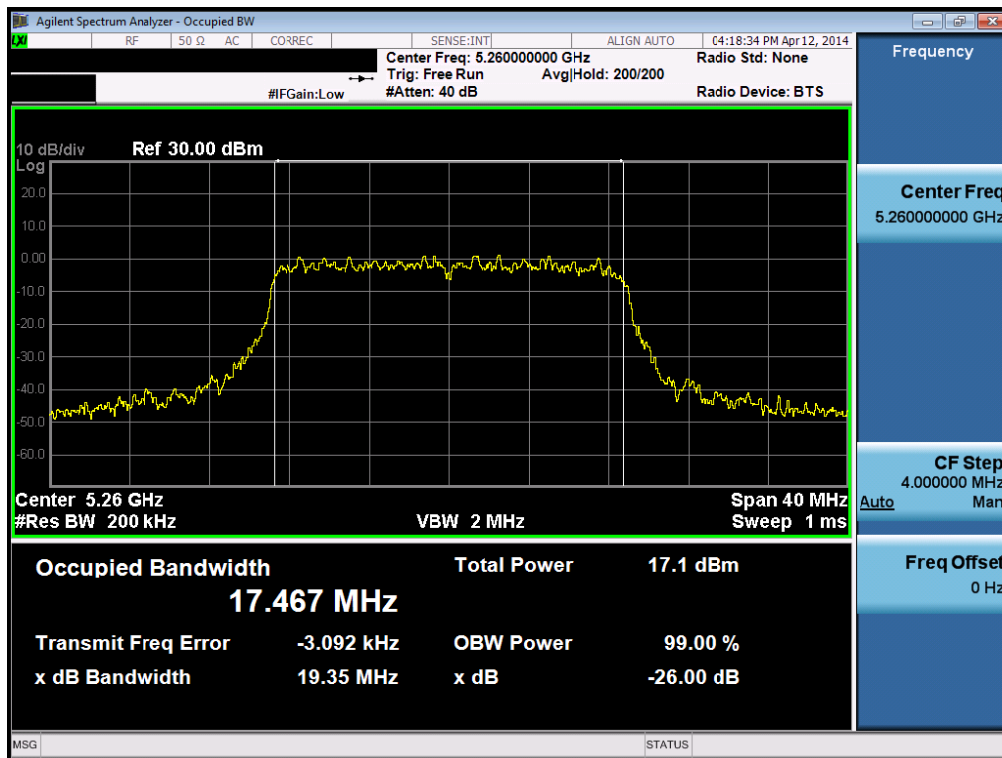
26 dB Bandwidth

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



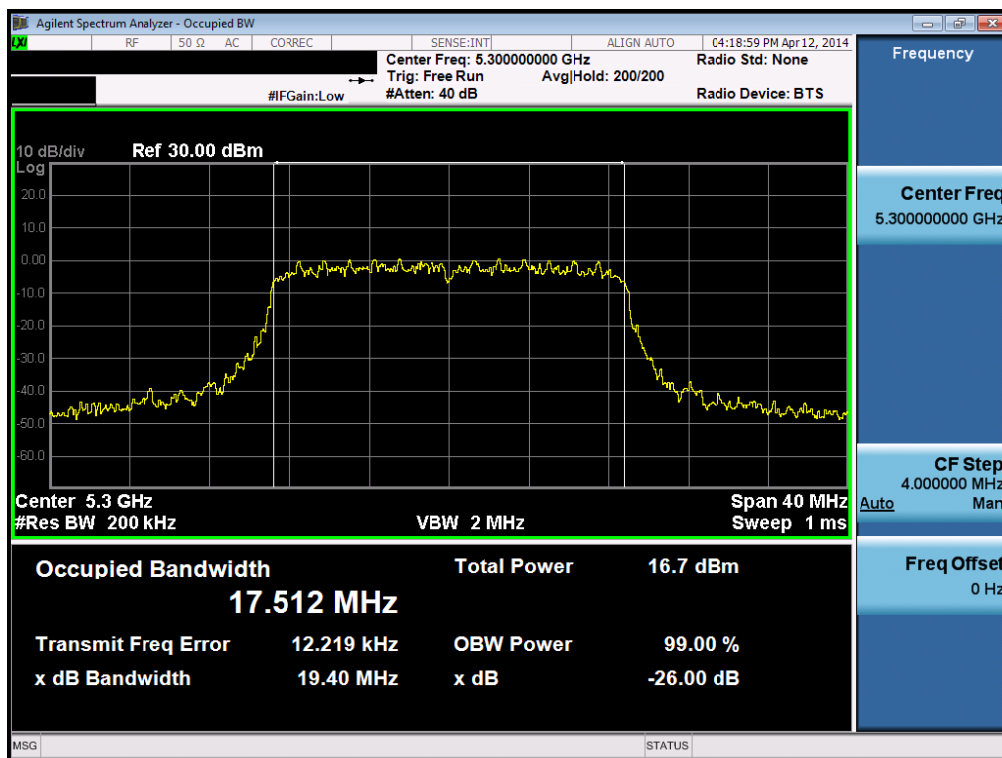
26 dB Bandwidth

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



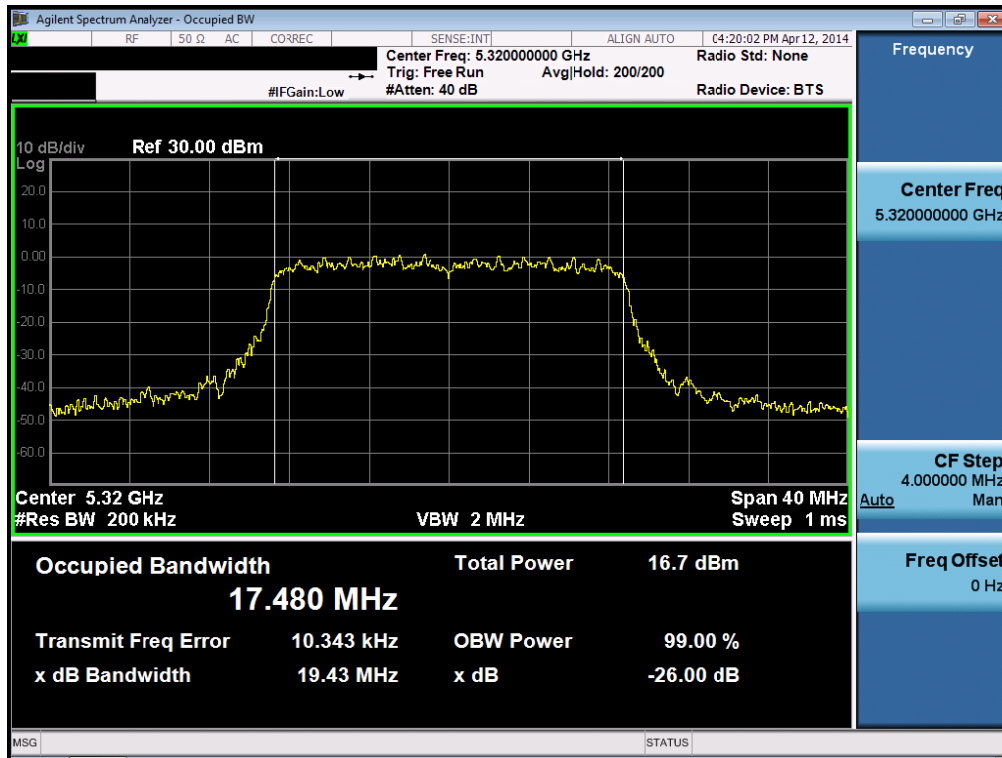
26 dB Bandwidth

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



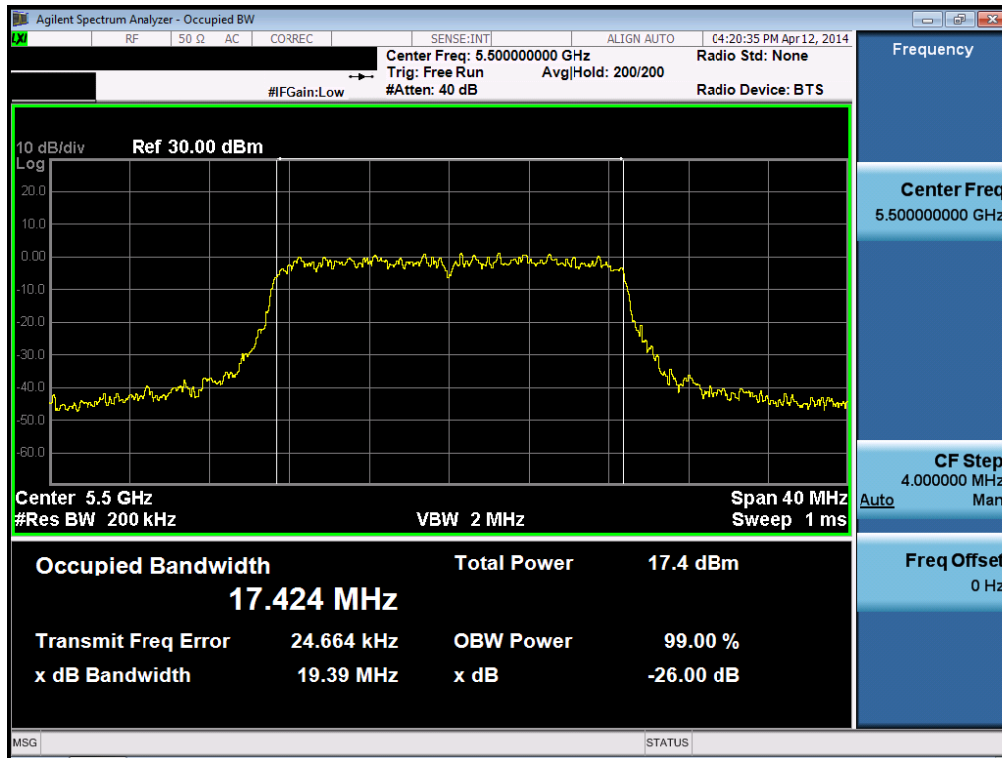
26 dB Bandwidth

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



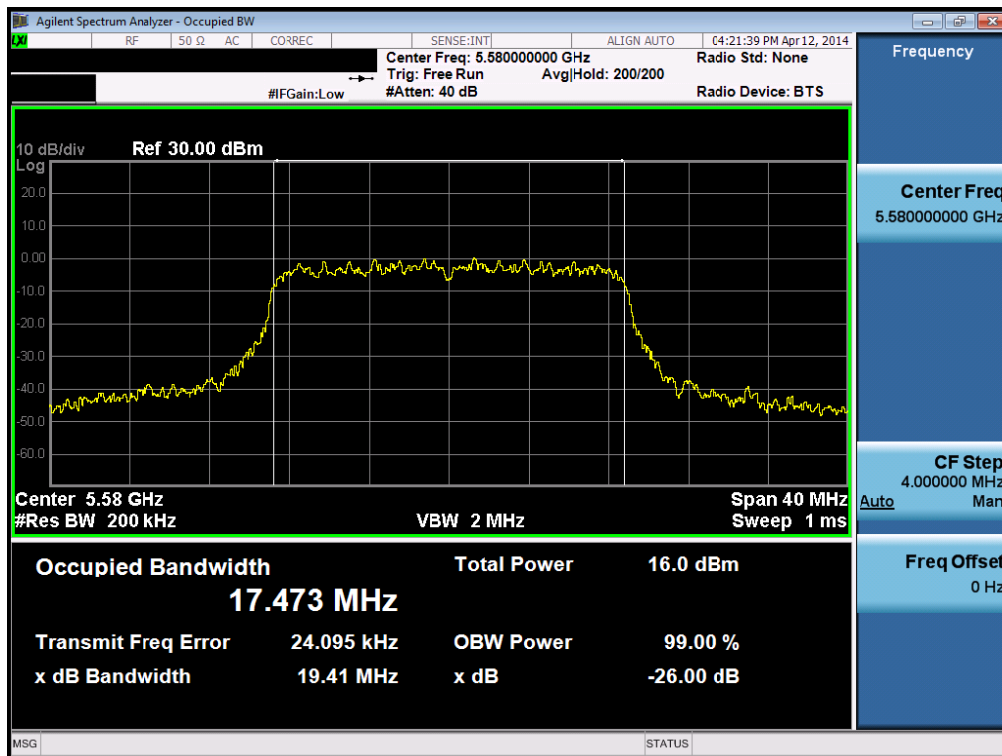
26 dB Bandwidth

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



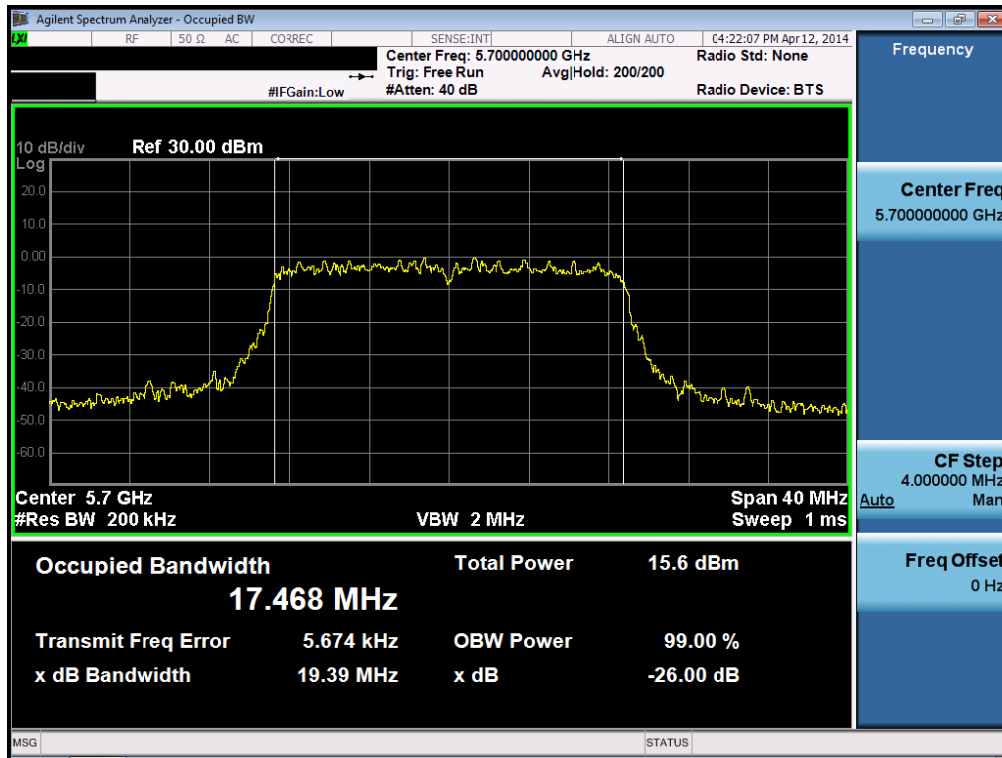
26 dB Bandwidth

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



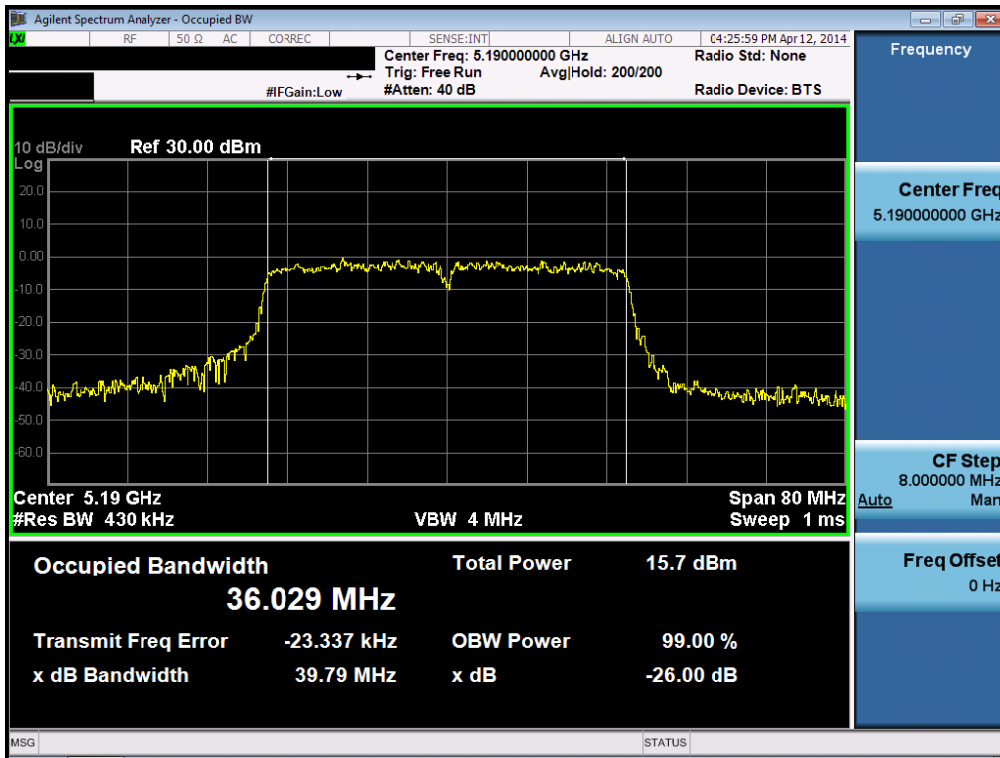
26 dB Bandwidth

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



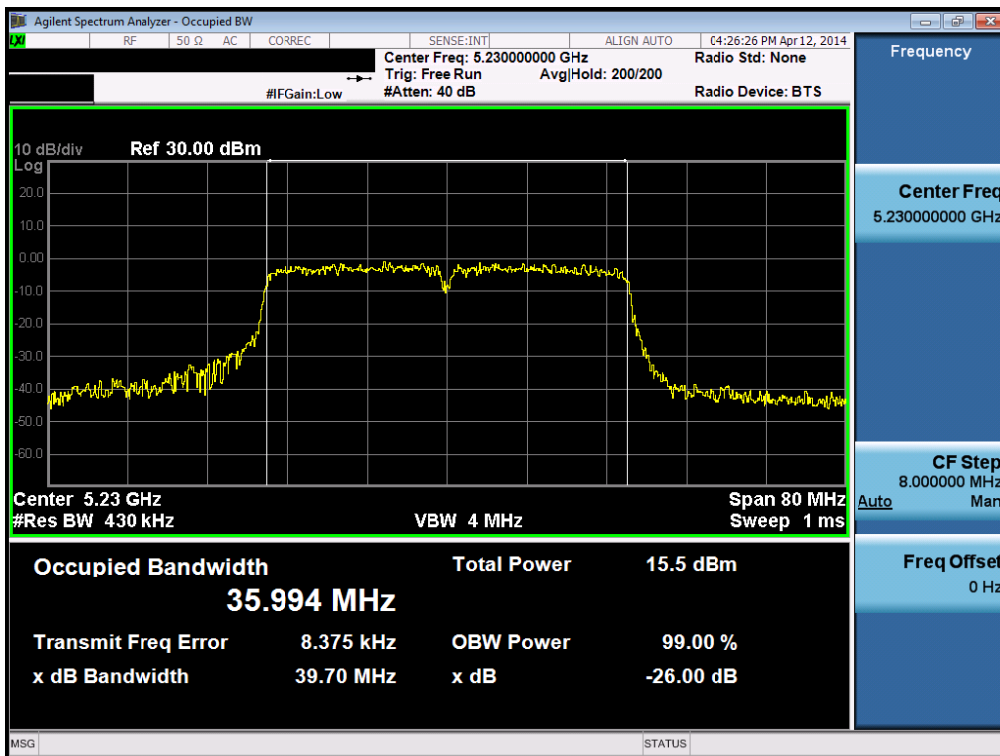
26 dB Bandwidth

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



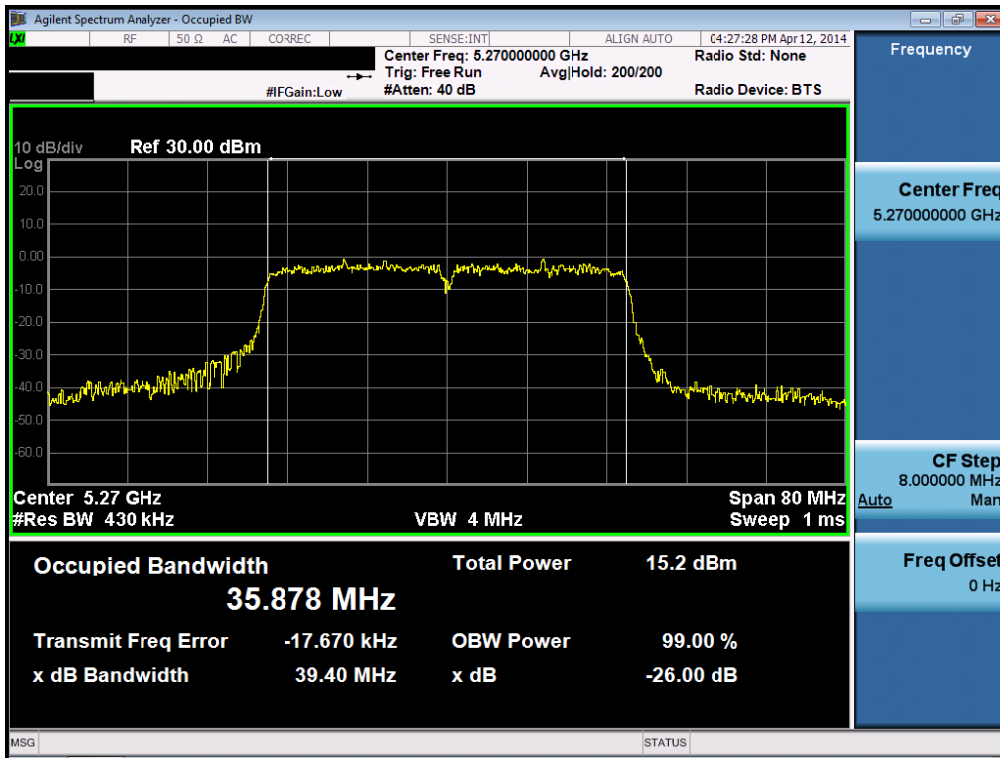
26 dB Bandwidth

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



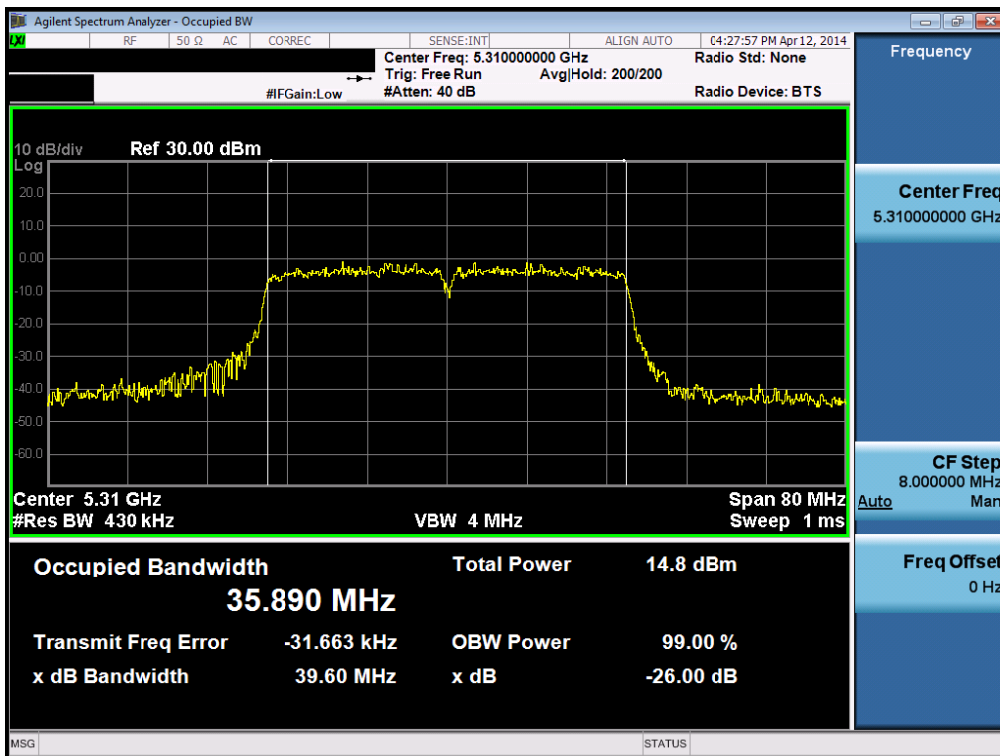
26 dB Bandwidth

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



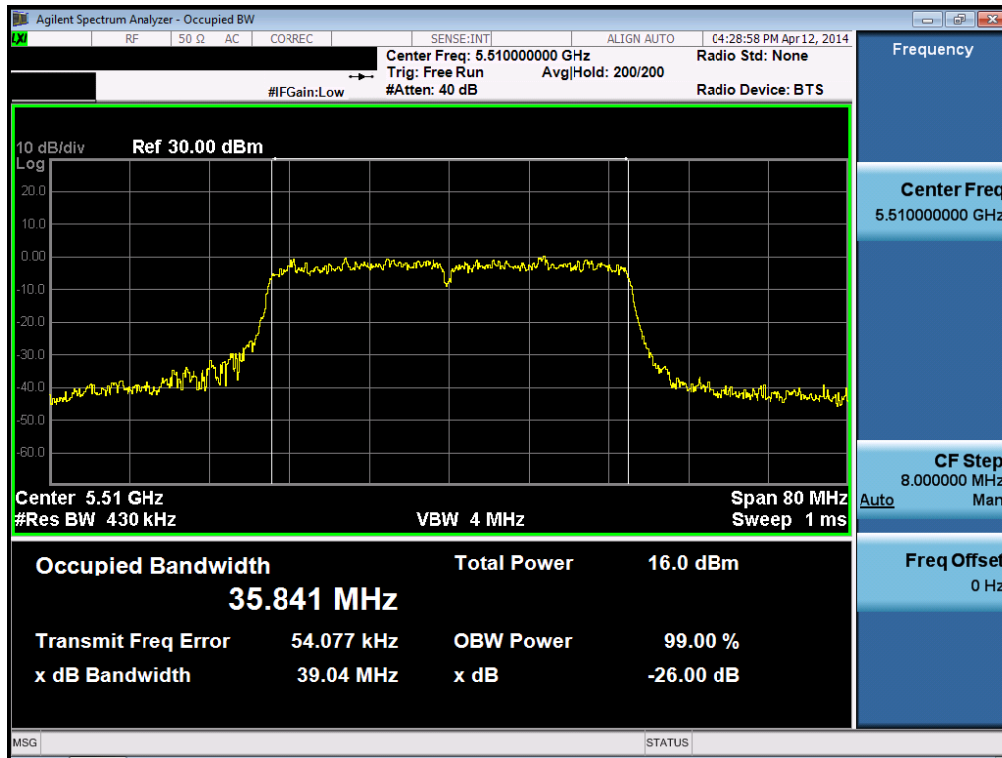
26 dB Bandwidth

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



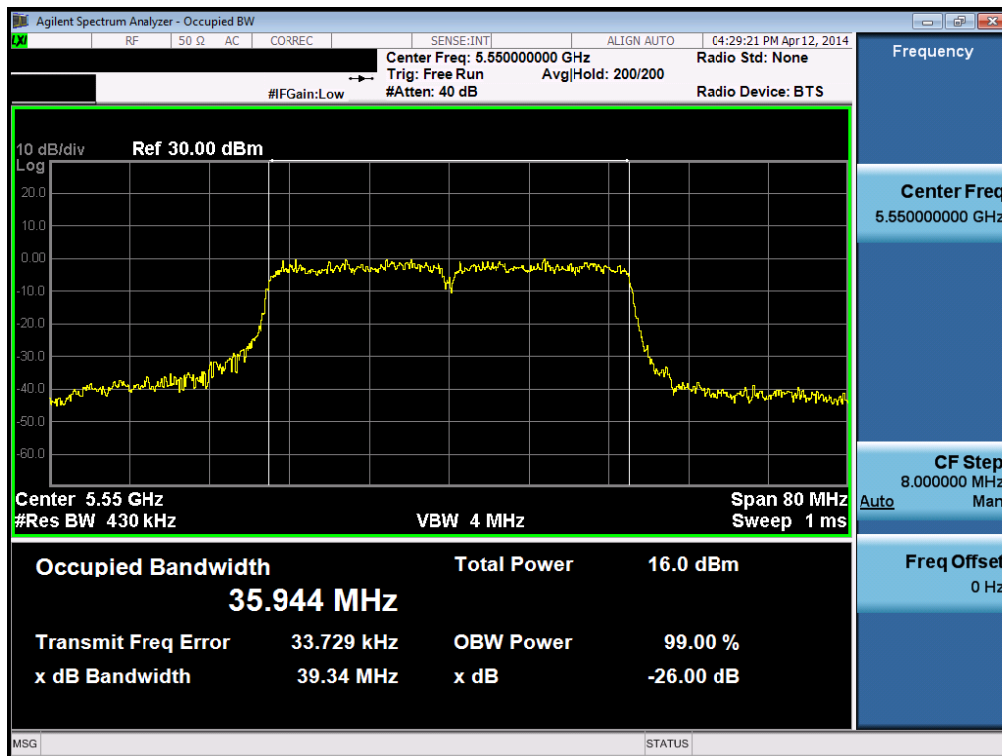
26 dB Bandwidth

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



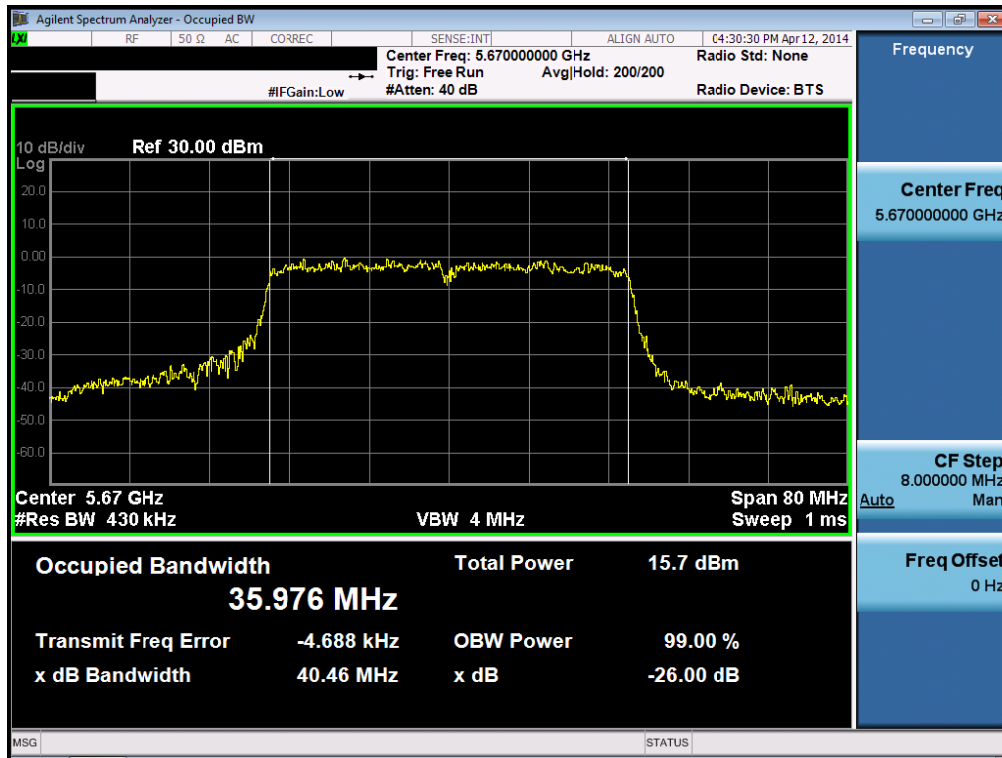
26 dB Bandwidth

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



26 dB Bandwidth

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



8.2 Maximum Conducted Output Power

■FCC Requirements

- (1) For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak 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 6dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

■IC Requirements

- (1) For the band 5.15~5.25 GHz, 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 the 5.25~5.35 GHz, the maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever power is less.
- (3) For the 5470~5600MHz and 5650 ~ 5725MHz, the maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever power is less.

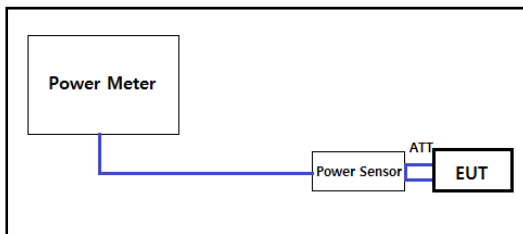
■Maximum conducted Output power Limit Calculation

Bands	Mode	Power Limit [mW]	Calculation Limit [dBm]	Determined Limit [dBm]
		Least 26dB BW [MHz]		
Band I	802.11a	50	16.98	16.73
		18.780	16.73	
	802.11n HT20	50	16.98	16.85
		19.290	16.85	
	802.11n HT40	50	16.98	16.98
		39.260	19.93	
Band II	802.11a	250	23.97	23.74
		18.810	23.74	
	802.11n HT20	250	23.97	23.86
		19.340	23.86	
	802.11n HT40	250	23.97	23.97
		39.300	26.94	
Band III	802.11a	250	23.97	23.74
		18.830	23.74	
	802.11n HT20	250	23.97	23.87
		19.390	23.87	
	802.11n HT40	250	23.97	23.97
		39.040	26.91	

Note 1: The directional gain does not exceed 6dBi. Please refer to clause 7.2.

Note 2: The limit was calculated using FCC requirements.

Test Configuration



Test Procedure

Maximum Conducted Output Power is measured using Measurement Procedure Method PM-Gof KDB789033 D02.

Test Results : **Comply**

Mode	CH	Freq. [MHz]	Test Result			
			ANT 1		ANT 2	
			[dBm]	[mW]	[dBm]	[mW]
802.11a	36	5180	11.038	12.700	11.099	12.880
	40	5200	10.713	11.784	10.563	11.384
	48	5240	10.936	12.405	11.216	13.231
	52	5260	11.037	12.697	10.611	11.511
	60	5300	11.100	12.882	11.563	14.332
	64	5320	11.004	12.601	11.394	13.785
	100	5500	11.037	12.697	11.469	14.025
	116	5580	10.836	12.123	10.988	12.555
	140	5700	10.791	11.998	10.731	11.833

Mode	CH	Freq. [MHz]	Test Result			
			ANT 1 [dBm]	ANT 2 [dBm]	SUM Power ^{Note1}	
					[dBm]	[mW]
802.11n HT20	36	5180	10.322	10.425	13.384	21.797
	40	5200	10.434	10.464	13.459	22.177
	48	5240	10.376	10.315	13.356	21.657
	52	5260	10.098	10.520	13.324	21.498
	60	5300	9.955	10.425	13.207	20.927
	64	5320	9.808	10.413	13.131	20.564
	100	5500	10.248	10.215	13.242	21.096
	116	5580	9.716	10.366	13.063	20.244
	140	5700	10.044	10.489	13.282	21.291
802.11n HT40	38	5190	10.315	10.154	13.246	21.115
	46	5230	9.903	9.867	12.895	19.476
	54	5270	10.035	9.714	12.888	19.445
	62	5310	10.525	10.192	13.372	21.737
	102	5510	10.322	9.637	13.003	19.966
	110	5550	10.298	9.724	13.031	20.096
	134	5670	10.559	10.659	13.620	23.014

Note 1: SUM power = $10 \log\left(10^{\frac{\text{ANT 1 Result}}{10}} + 10^{\frac{\text{ANT 2 Result}}{10}}\right)$

8.3 Peak Power Spectral Density

■ FCC Requirements

- (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1MHz band.
- (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 megahertz band.

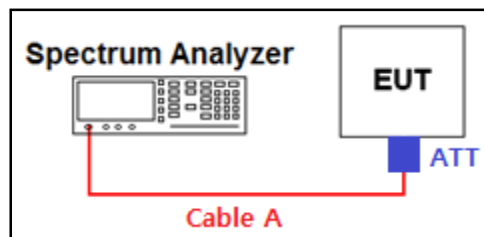
■ IC Requirements

- (1) For the band 5.15~5.25 GHz, the e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.
- (2) For the 5.25~5.35 GHz, the power spectral density shall not exceed 11 dBm in any 1.0 MHz band.
- (3) For the 5470~5600MHz and 5650 ~ 5725MHz, the power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

■ Peak Power Spectral Density Limit Calculation

Note 1: The directional gain does not exceed 6dBi. Please refer to clause 7.2.

■ Test Configuration



■ Test Procedure

Peak Power Spectral Density is measured using Measurement Procedure of **KDB789033 D02**.

- 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: 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 spectrum analyzer to find the peak of the spectrum.
- 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 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 PPSD.

■TEST RESULTS :Comply

Mode	CH	Freq. [MHz]	Reading		Duty Cycle (x)	DCF [dB]	Test Result	
			ANT 1 [dBm]	ANT 2 [dBm]			ANT 1 [dBm]	ANT 2 [dBm]
802.11a	36	5180	-3.533	-3.444	0.46	3.38	-0.153	-0.064
	40	5200	-3.013	-3.439			0.367	-0.059
	48	5240	-2.813	-3.332			0.567	0.048
	52	5260	-3.084	-3.100			0.296	0.280
	60	5300	-3.090	-3.105			0.290	0.275
	64	5320	-3.090	-3.153			0.290	0.227
	100	5500	-2.934	-3.182			0.446	0.198
	116	5580	-3.488	-3.073			-0.108	0.307
	140	5700	-3.807	-3.605	-0.427	-0.225		

Mode	CH	Freq. [MHz]	Reading		Duty Cycle (x)	DCF [dB]	Test Result		
			ANT 1 [dBm]	ANT 2 [dBm]			ANT 1 [dBm]	ANT 2 [dBm]	SUM Power [dBm] ^{Note2}
802.11n HT20	36	5180	-5.344	-5.114	0.44	3.57	-1.774	-1.544	1.353
	40	5200	-6.107	-5.091			-2.537	-1.521	1.011
	48	5240	-5.055	-5.104			-1.485	-1.534	1.501
	52	5260	-5.193	-4.996			-1.623	-1.426	1.487
	60	5300	-5.307	-5.504			-1.737	-1.934	1.176
	64	5320	-5.706	-4.857			-2.136	-1.287	1.320
	100	5500	-5.932	-5.523			-2.362	-1.953	0.858
	116	5580	-5.048	-6.030			-1.478	-2.460	1.069
	140	5700	-6.159	-6.253	-2.589	-2.683	0.375		
802.11n HT40	38	5190	-9.904	-9.685	0.32	4.95	-4.954	-4.735	-1.833
	46	5230	-9.955	-10.070			-5.005	-5.120	-2.052
	54	5270	-10.258	-10.136			-5.308	-5.186	-2.236
	62	5310	-10.774	-10.879			-5.824	-5.929	-2.866
	102	5510	-10.194	-9.103			-5.244	-4.153	-1.654
	110	5550	-9.905	-9.957			-4.955	-5.007	-1.971
	134	5670	-10.440	-10.180	-5.490	-5.230	-2.348		

Note 1 :Duty cycle(x) = On time / (On + Off time), For On time and On time information, please refer to APPENDIX II.

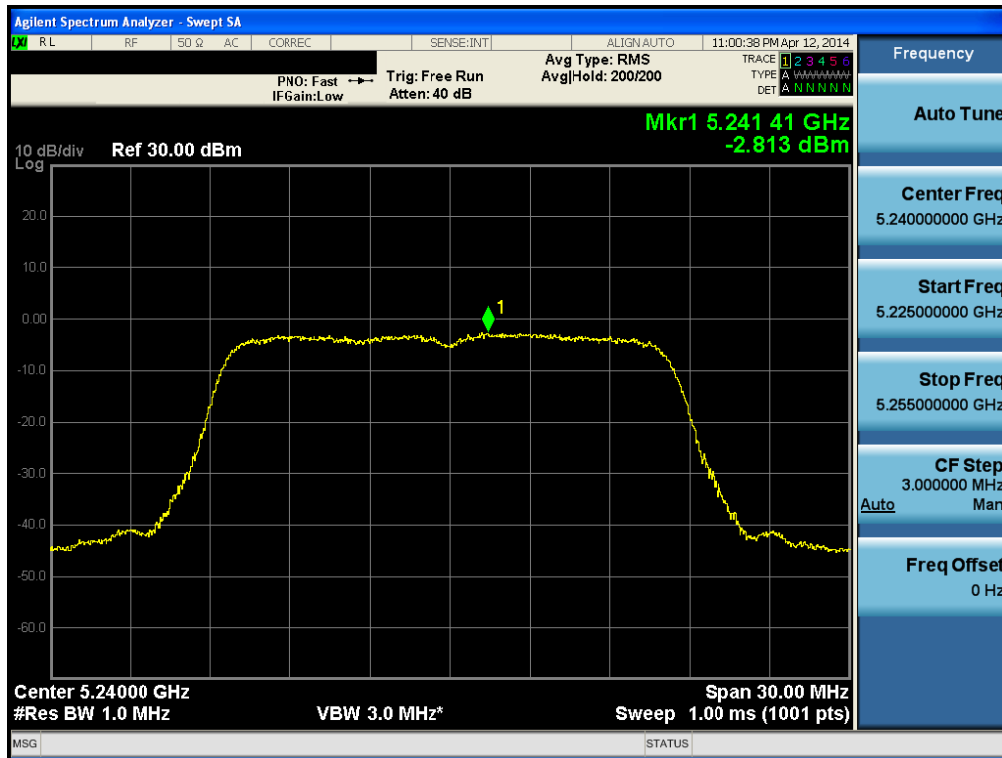
$$DCF = 10 * \log (1 / x)$$

$$Test\ Result = Reading\ Data + DCF$$

$$Note\ 2: SUM\ power = 10 \log(10^{\frac{ANT\ 1}{10}} + 10^{\frac{ANT\ 2}{10}})$$

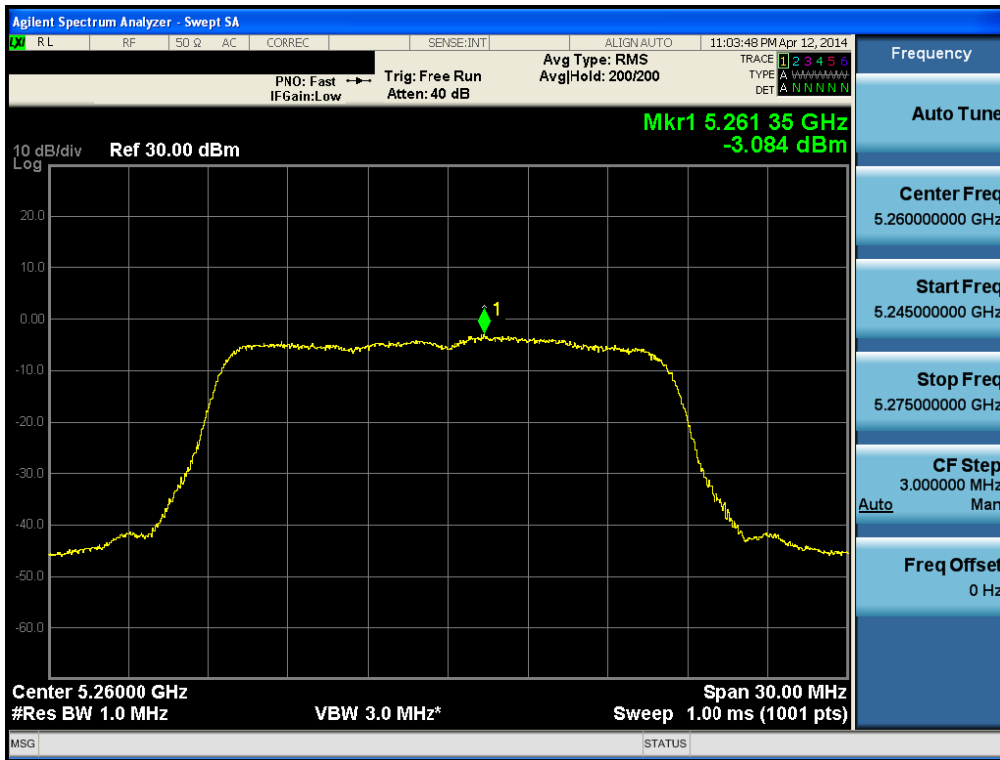
Peak Power Spectral Density

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



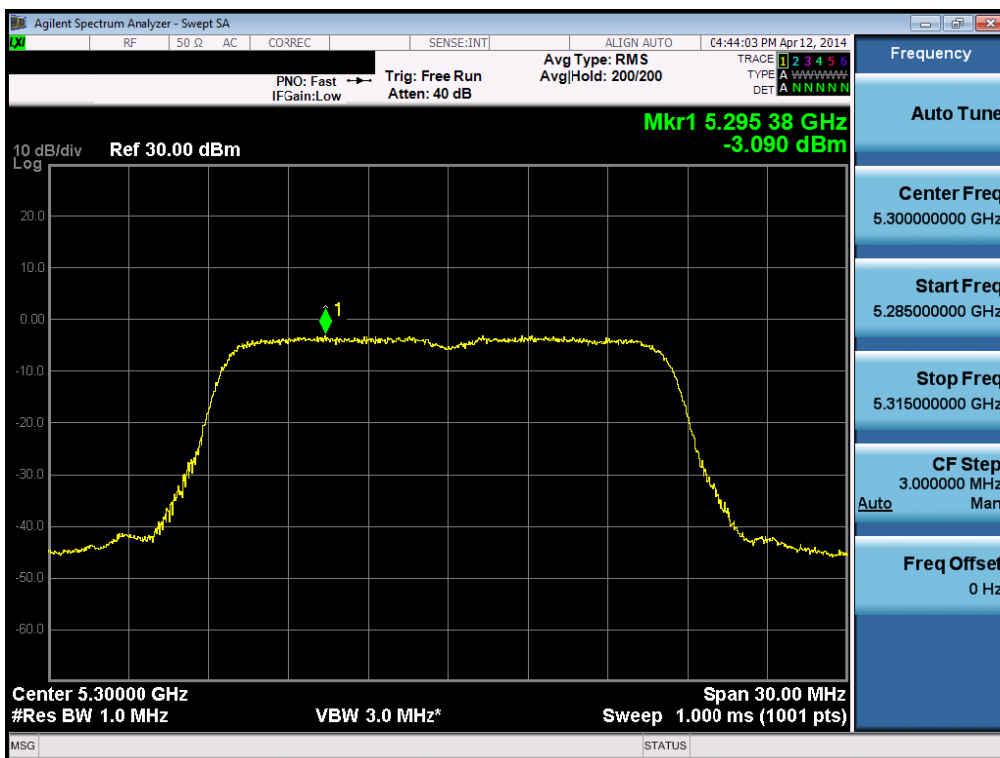
Peak Power Spectral Density

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



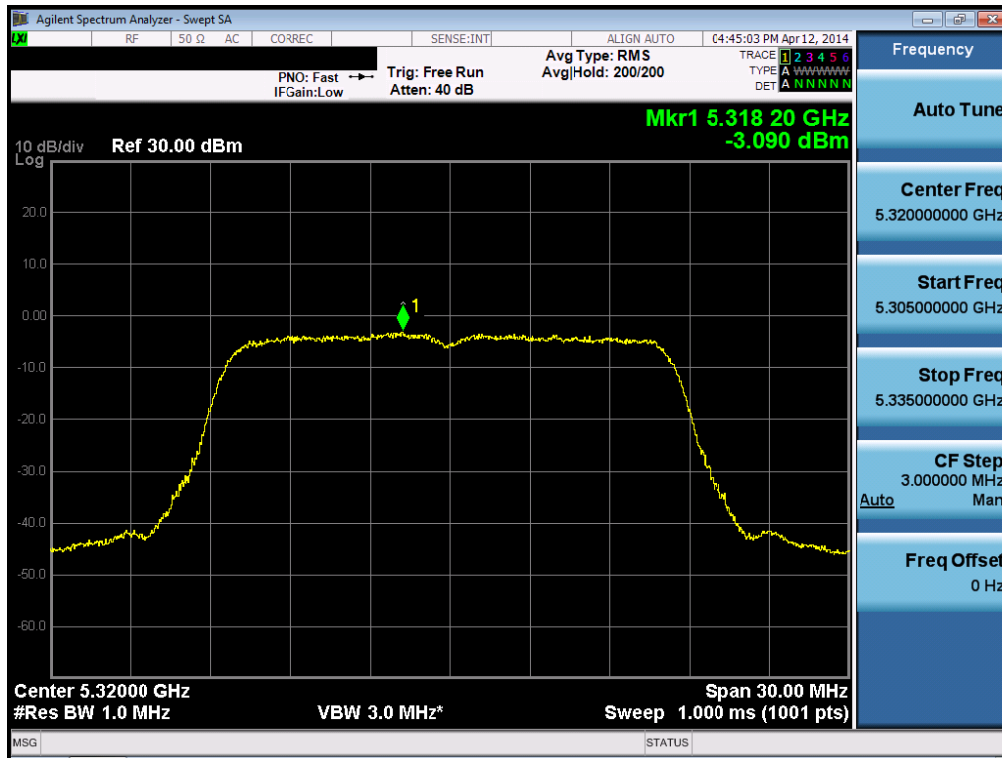
Peak Power Spectral Density

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



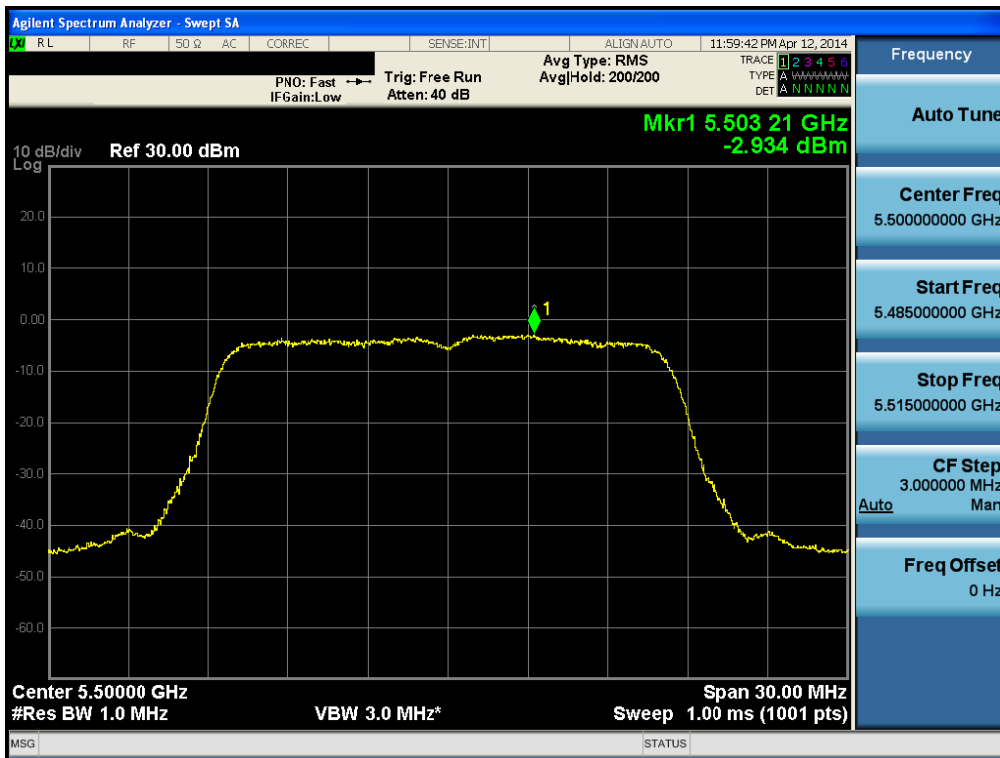
Peak Power Spectral Density

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



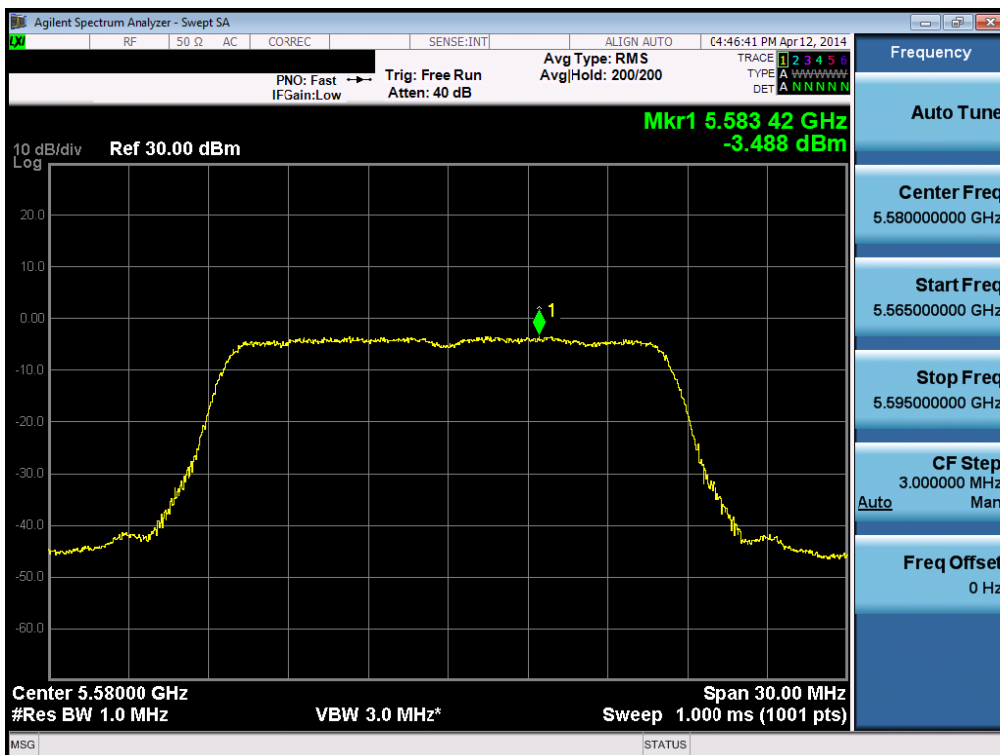
Peak Power Spectral Density

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



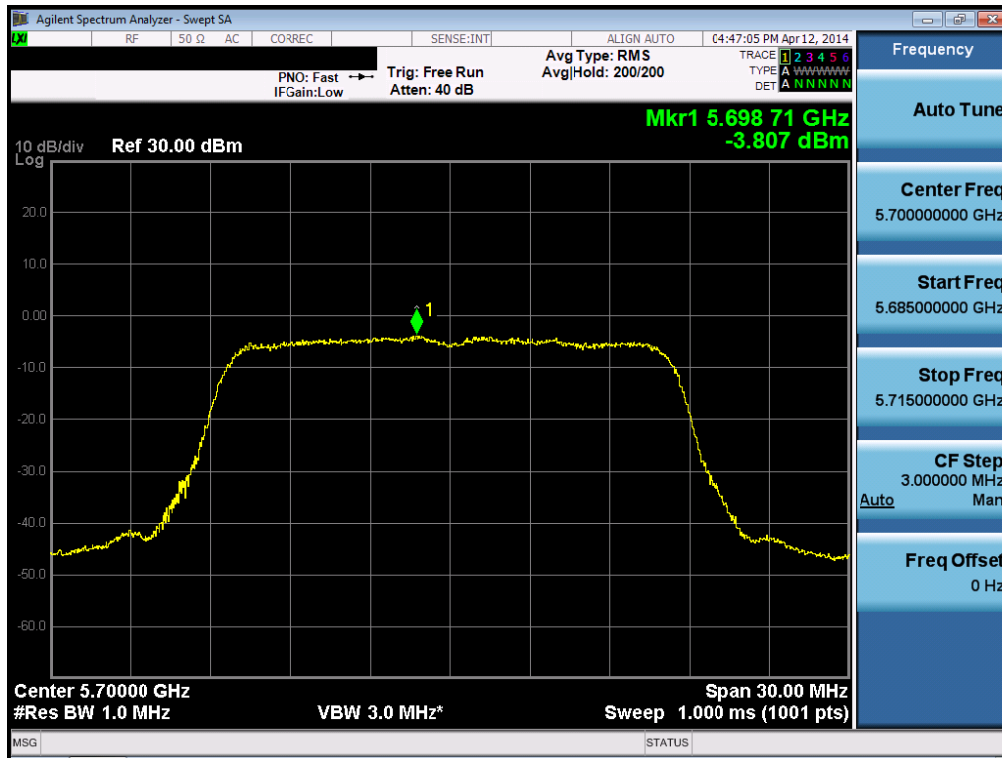
Peak Power Spectral Density

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



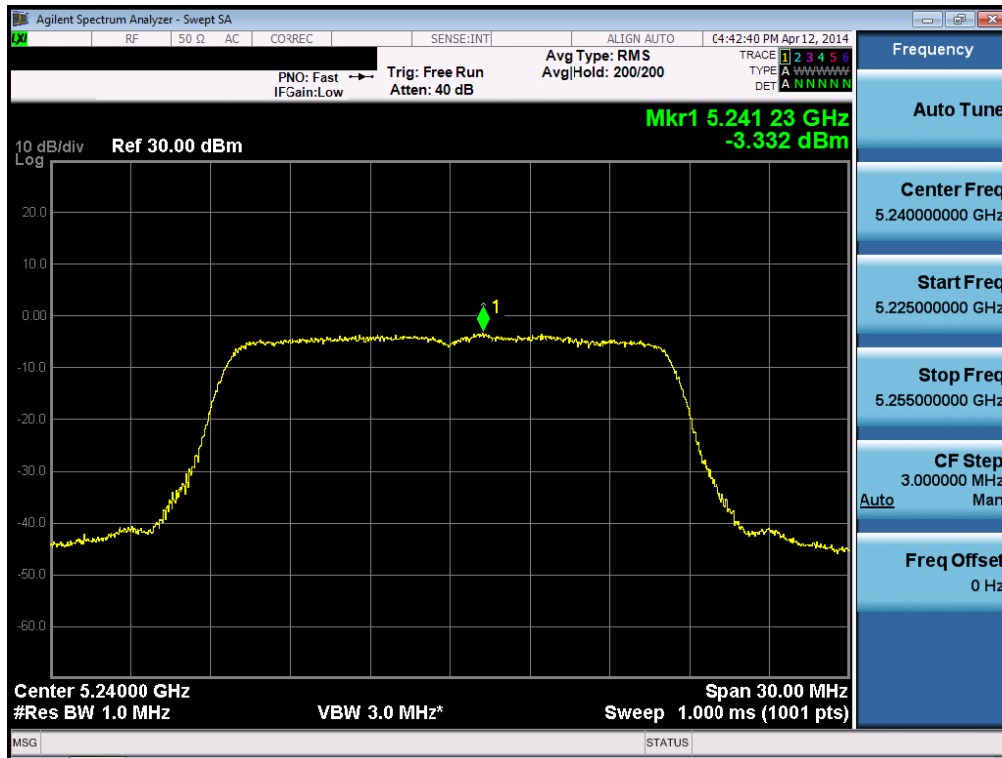
Peak Power Spectral Density

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



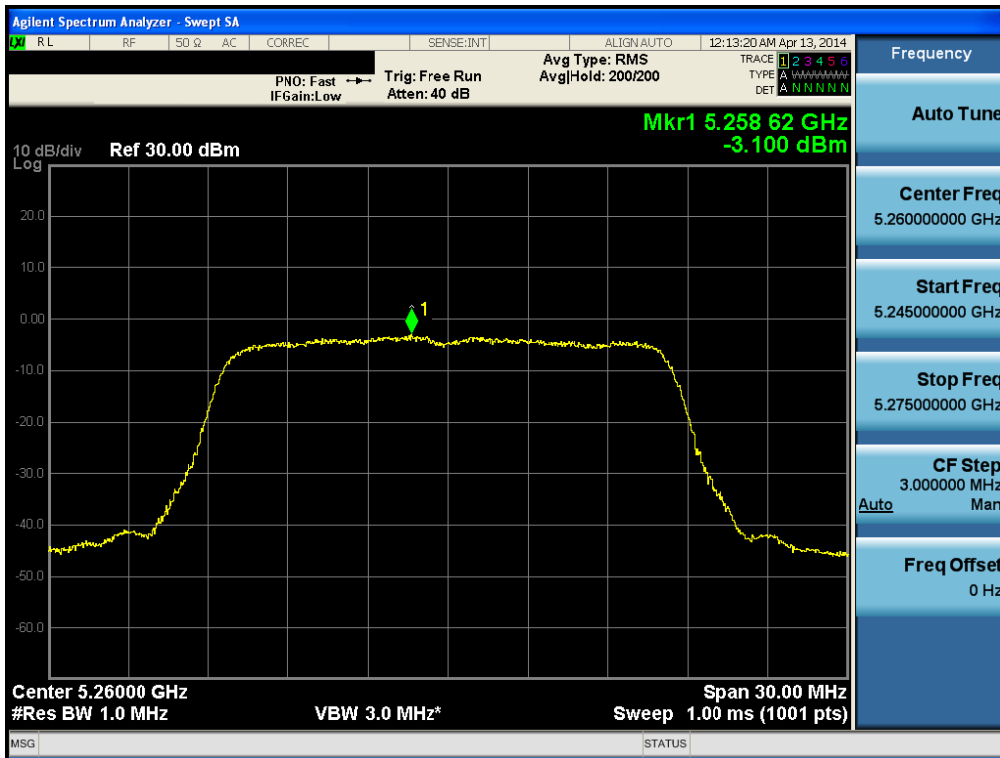
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.48



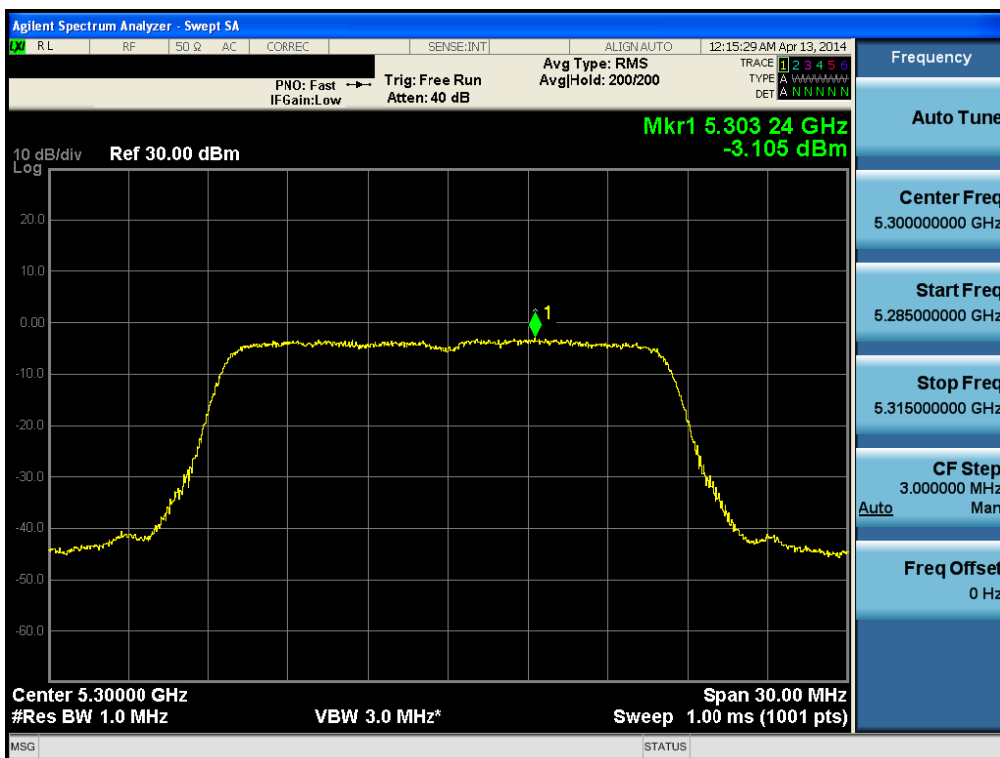
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.52



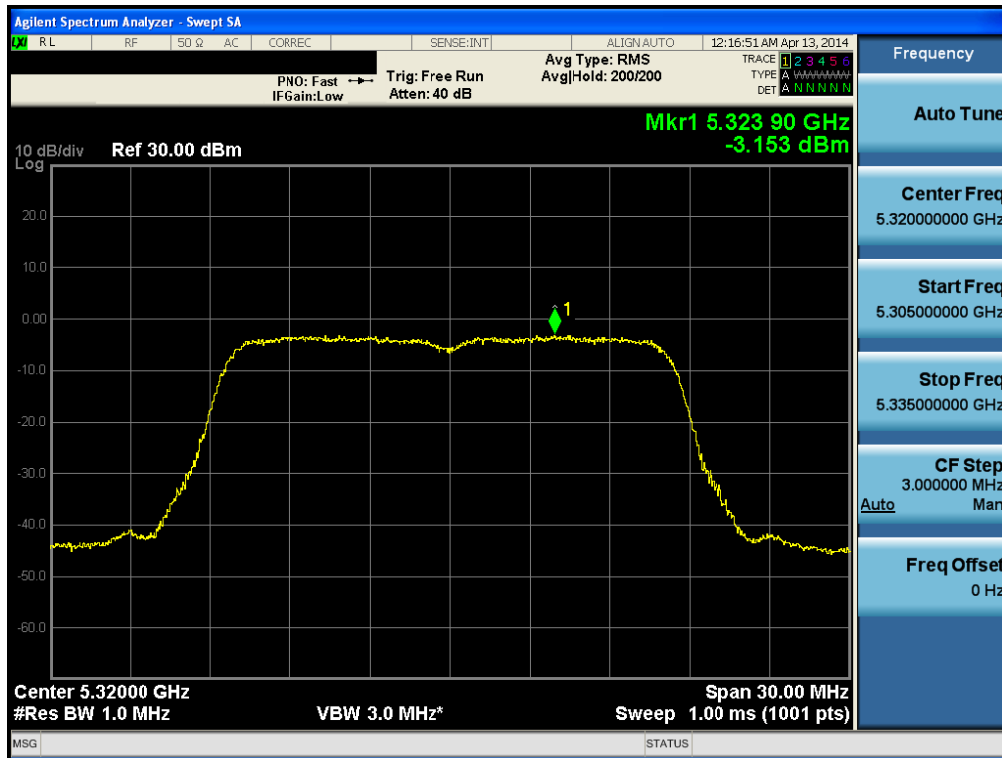
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.60



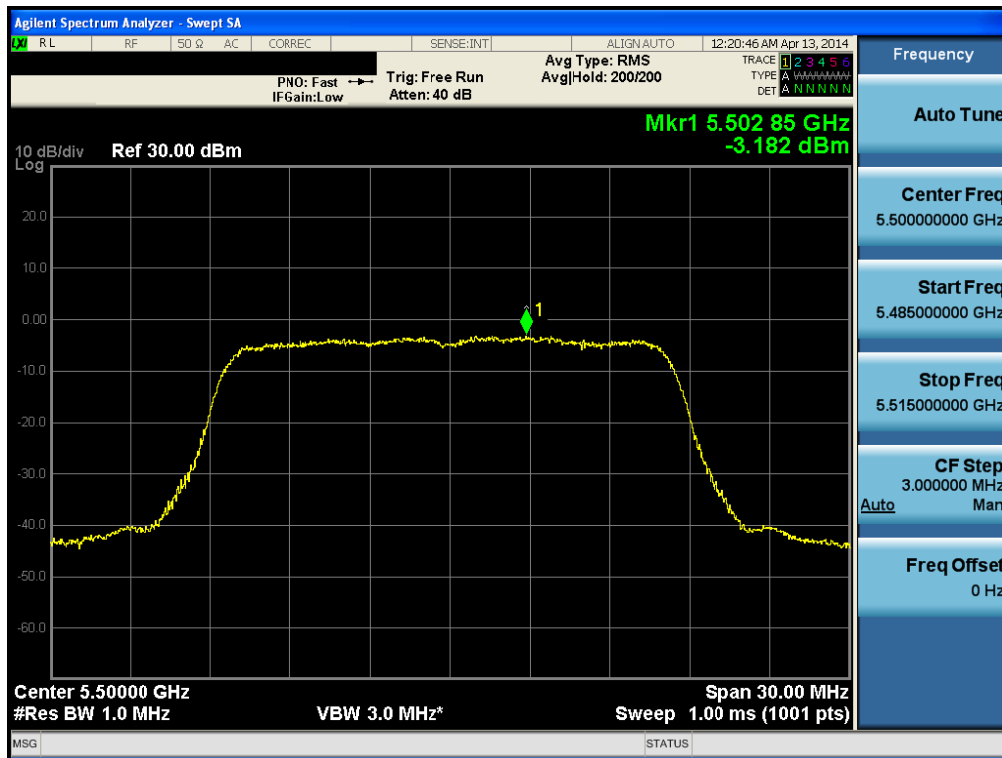
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.64



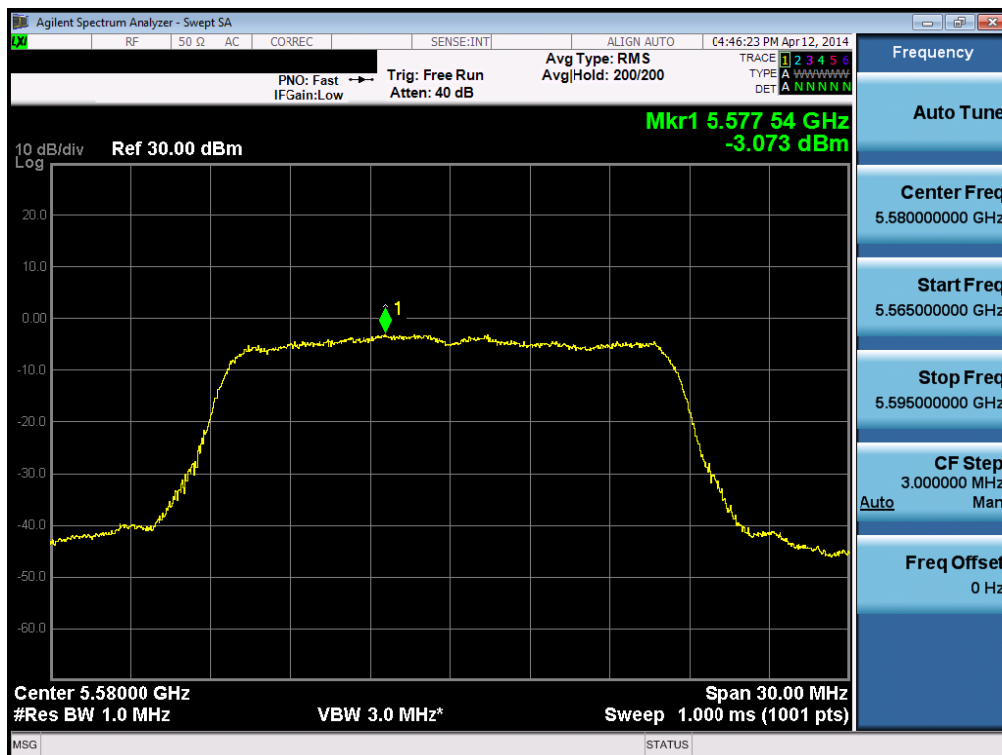
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.100



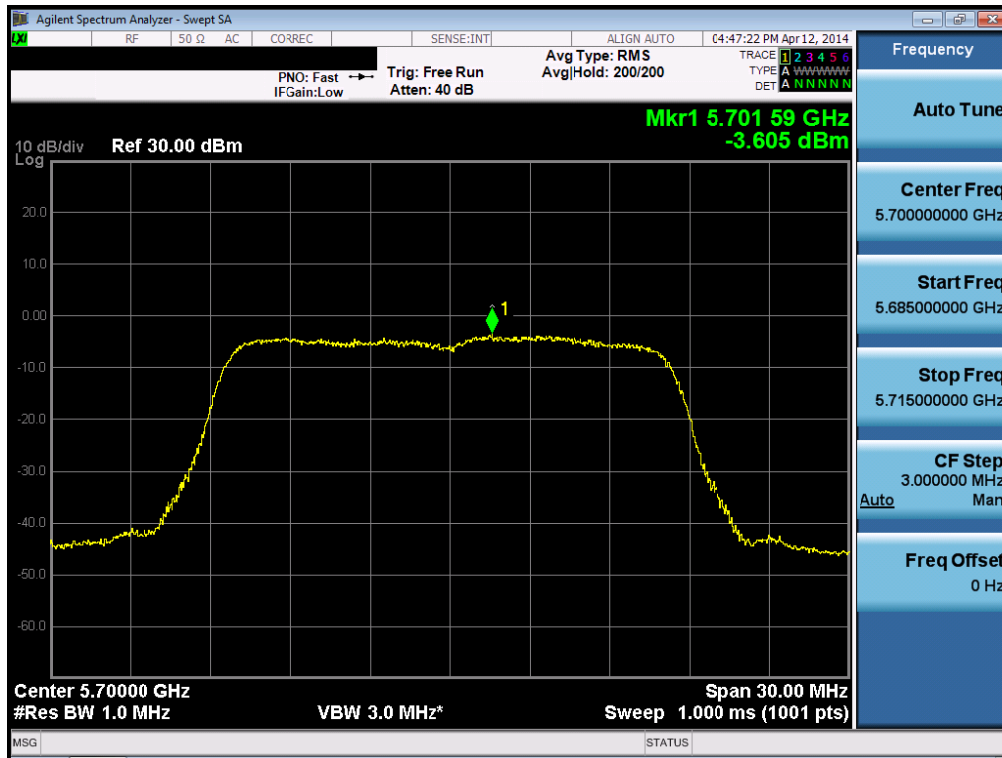
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.116



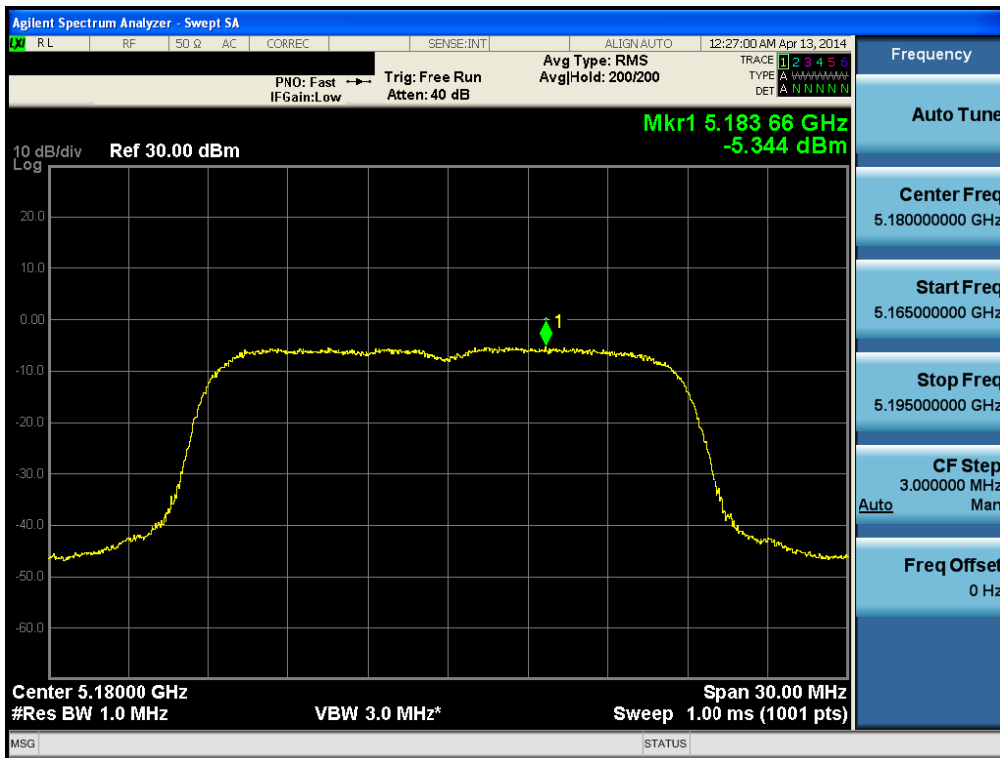
Peak Power Spectral Density

Test Mode: ANT 2 & 802.11a & Ch.140



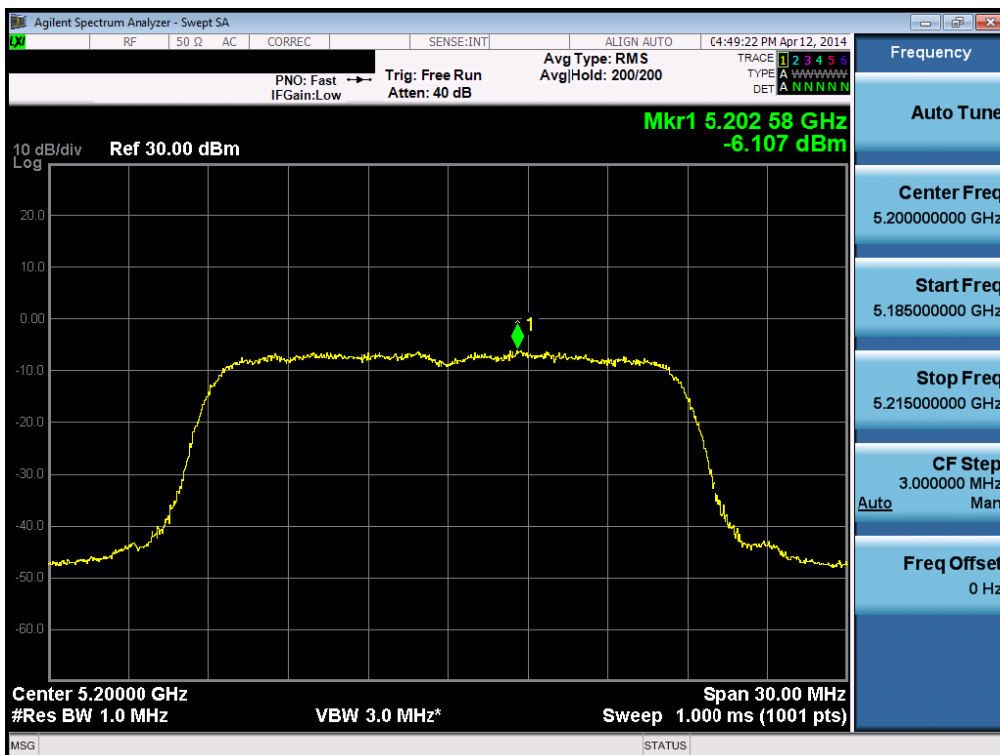
Peak Power Spectral Density

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



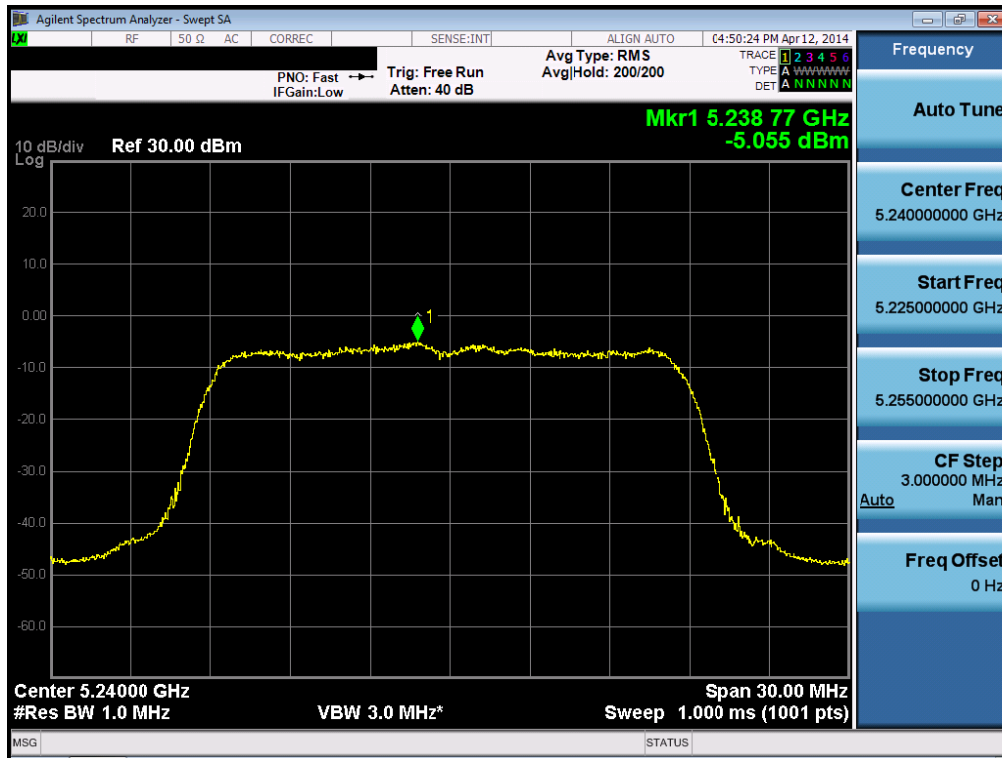
Peak Power Spectral Density

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



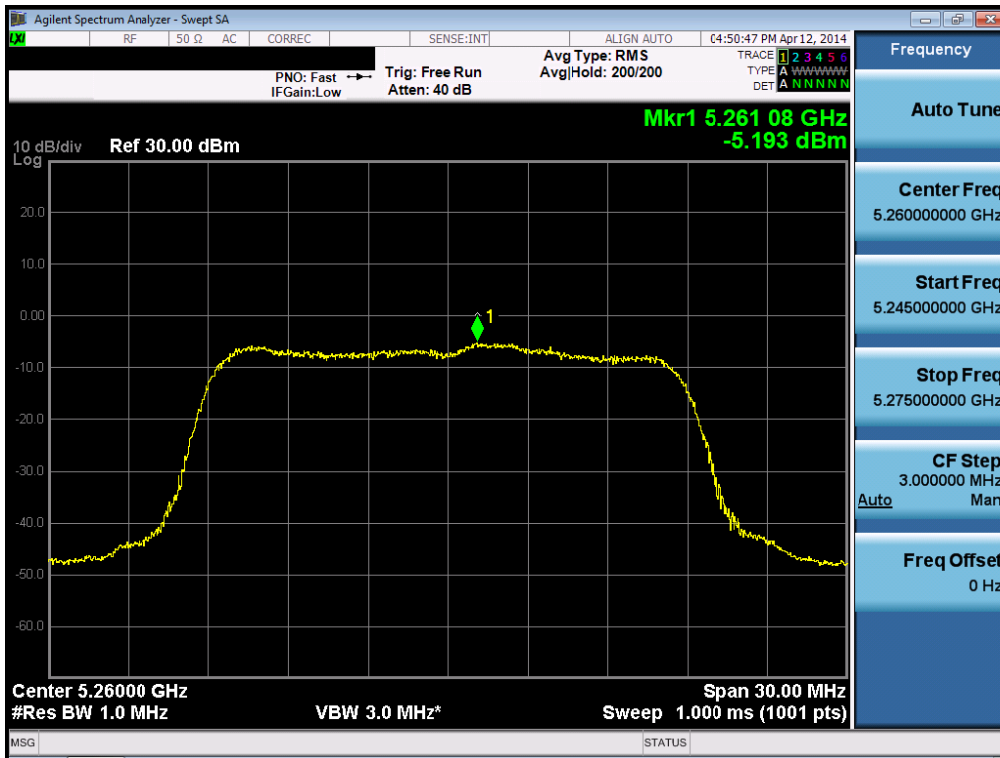
Peak Power Spectral Density

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



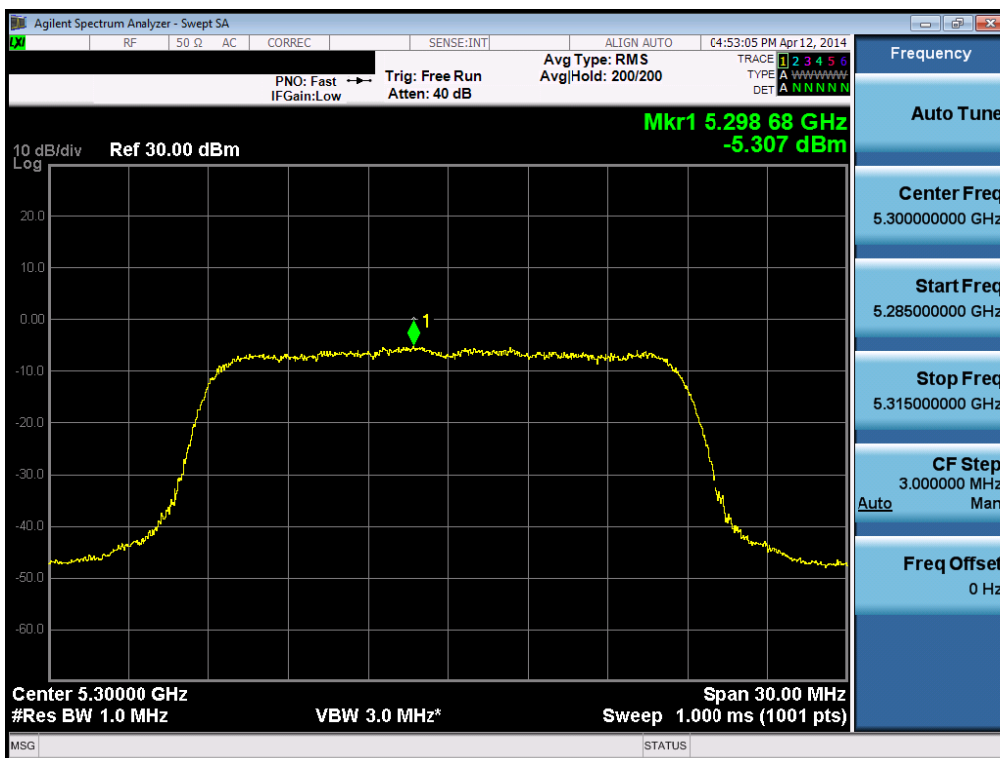
Peak Power Spectral Density

Test Mode: ANT 1 & 802.11n HT20 & Ch.52



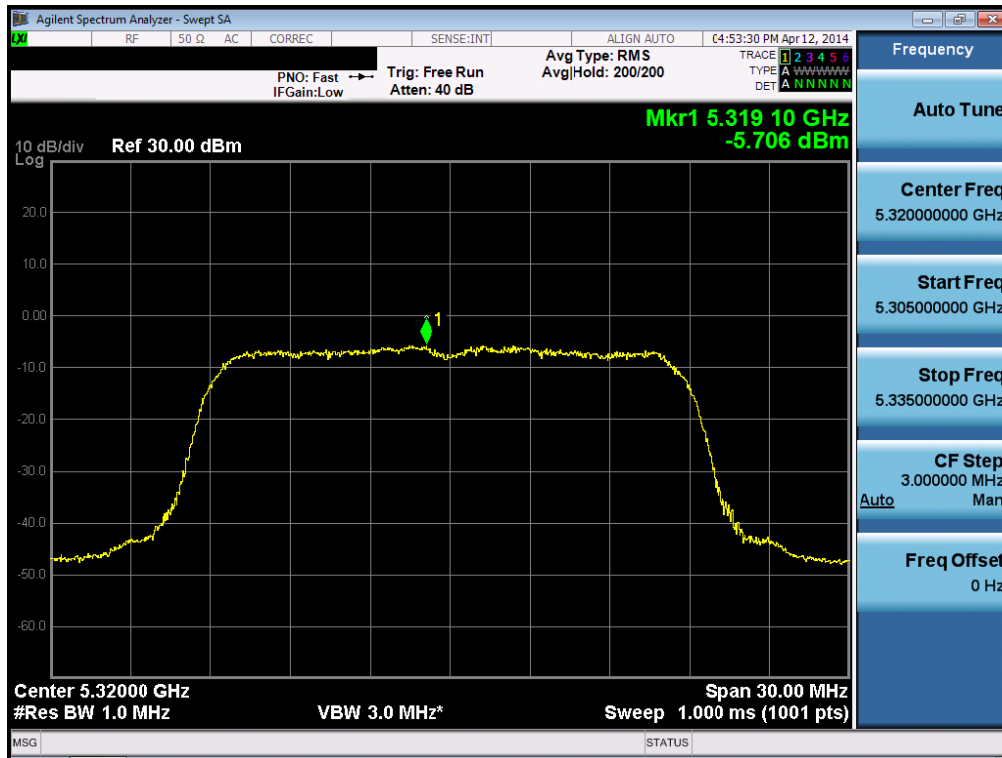
Peak Power Spectral Density

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



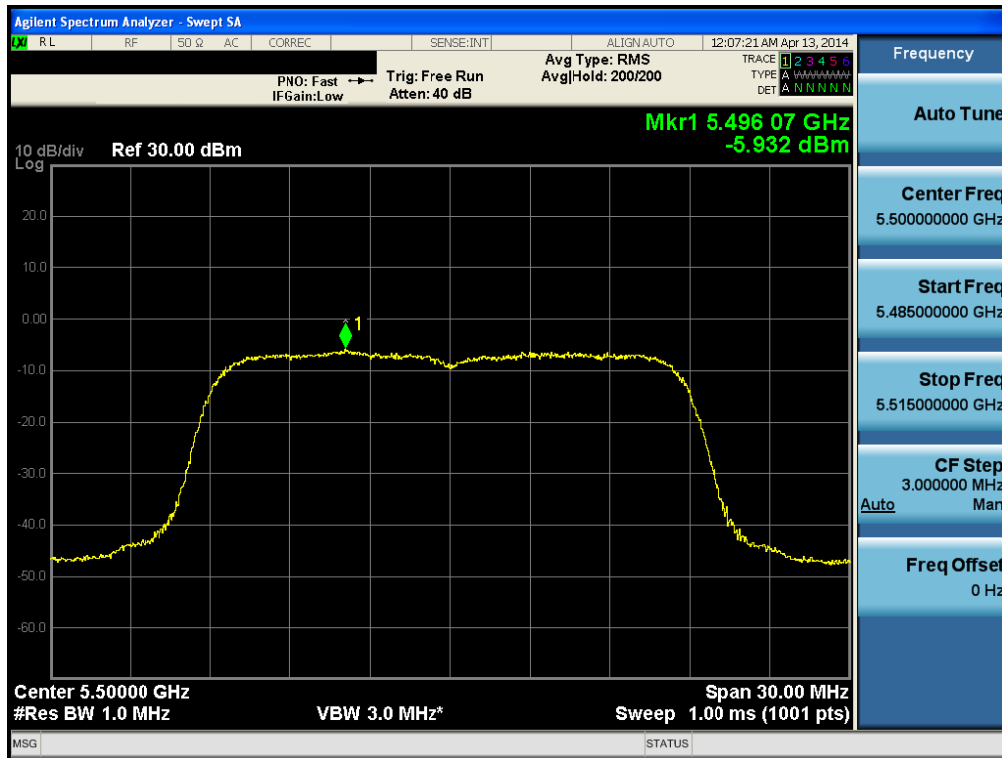
Peak Power Spectral Density

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



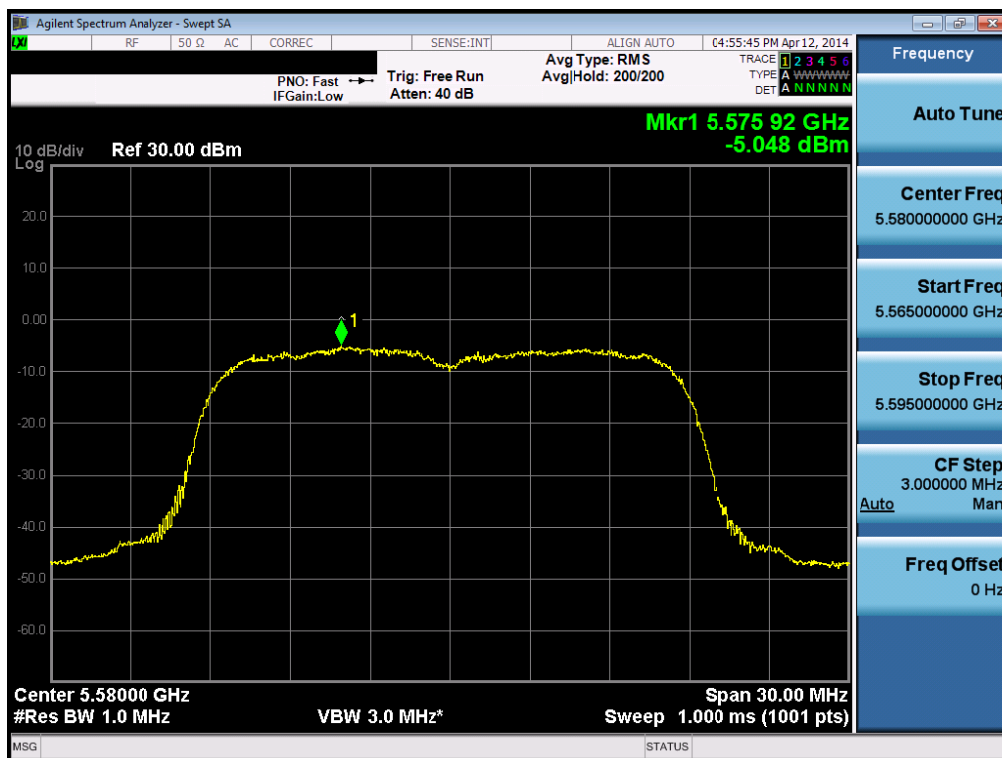
Peak Power Spectral Density

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



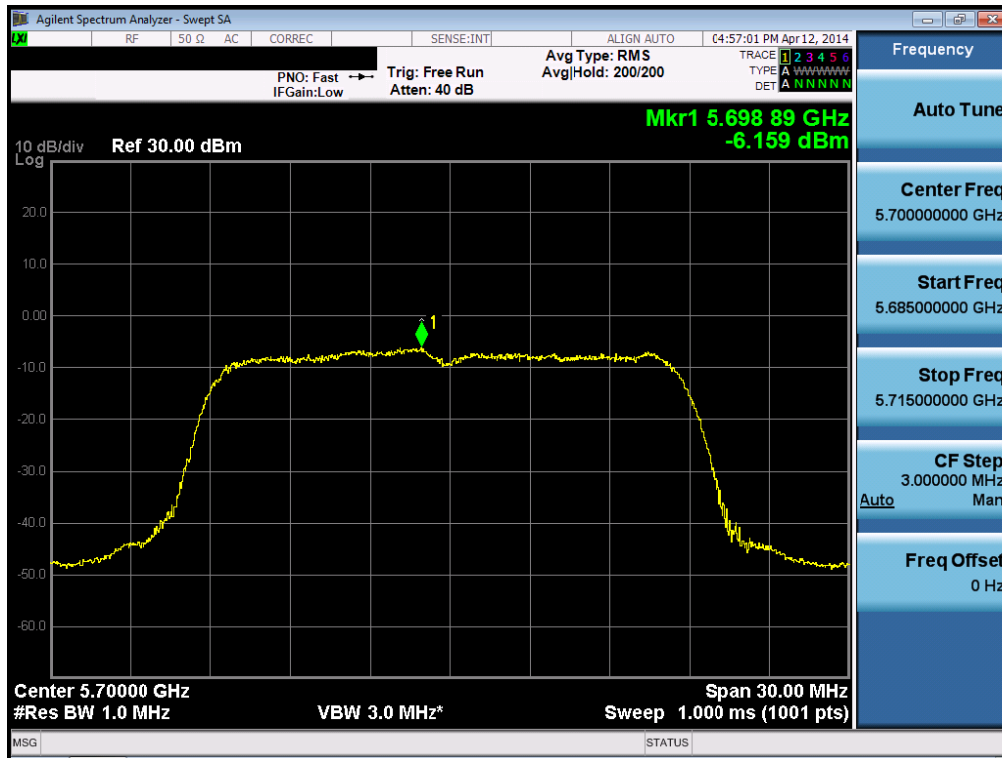
Peak Power Spectral Density

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



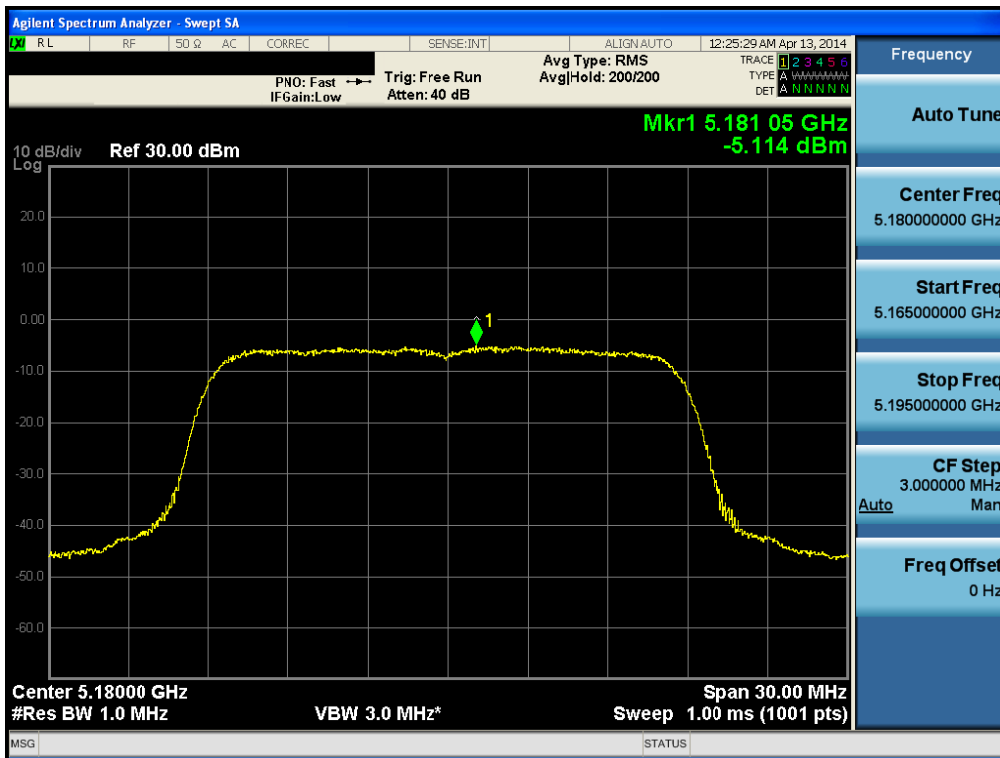
Peak Power Spectral Density

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



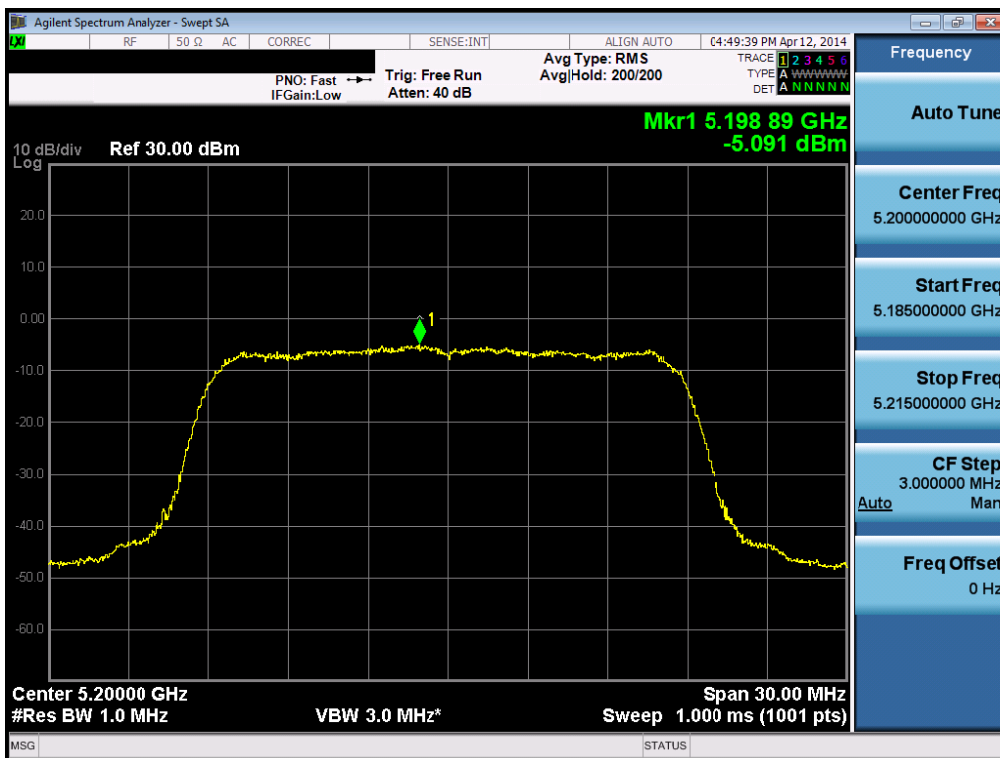
Peak Power Spectral Density

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



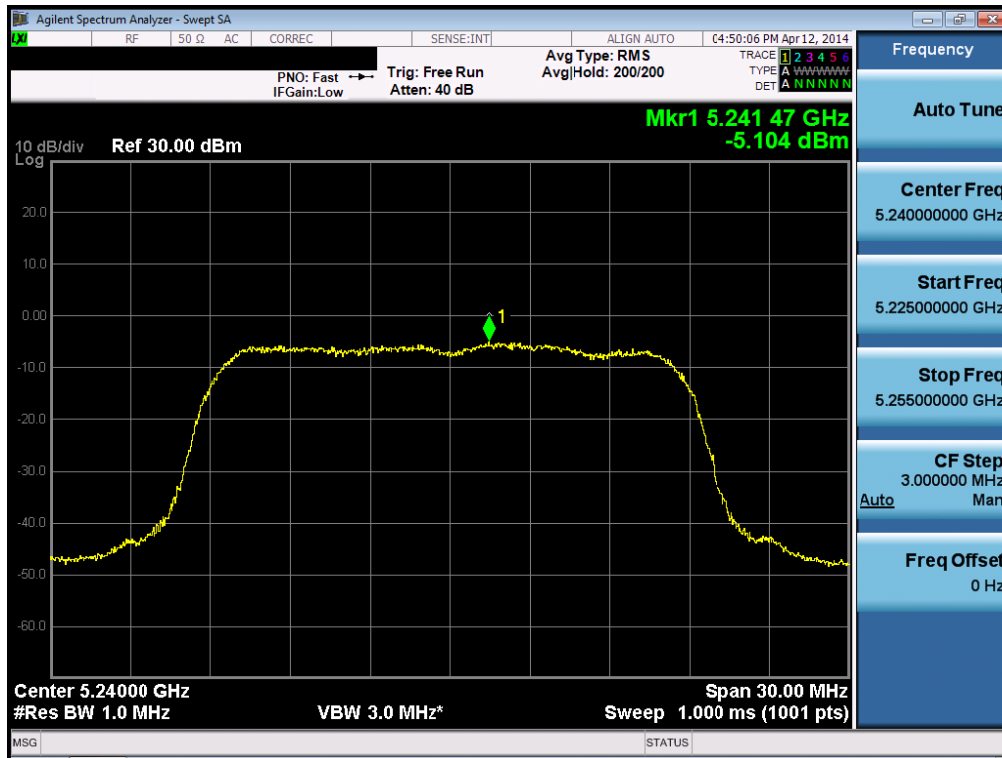
Peak Power Spectral Density

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



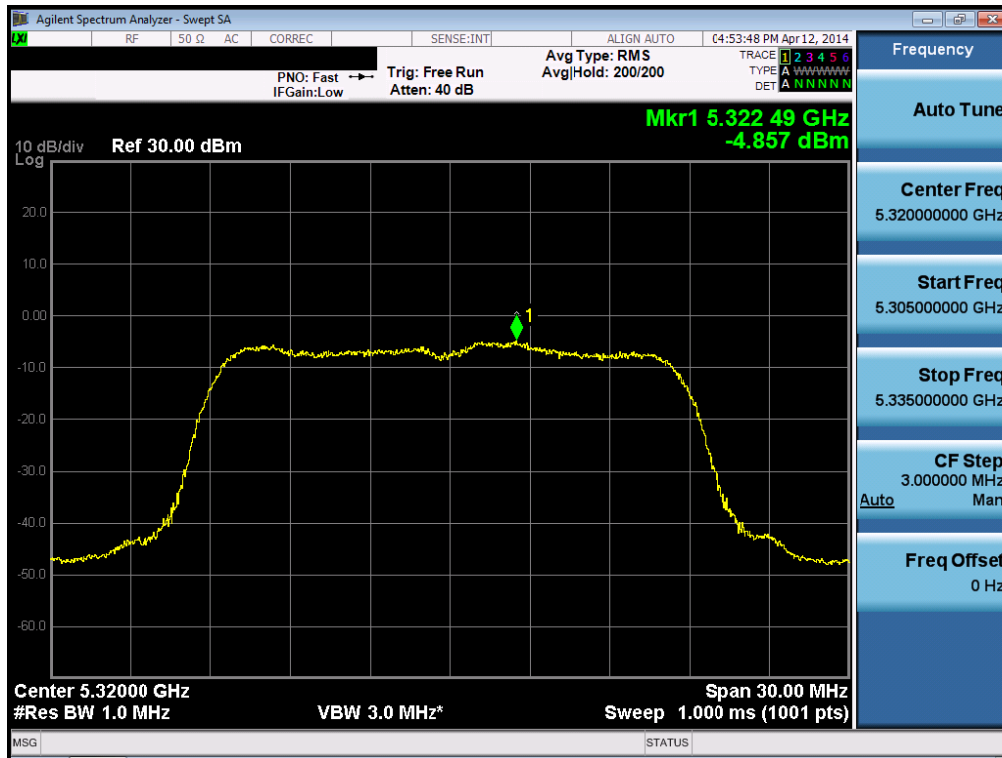
Peak Power Spectral Density

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



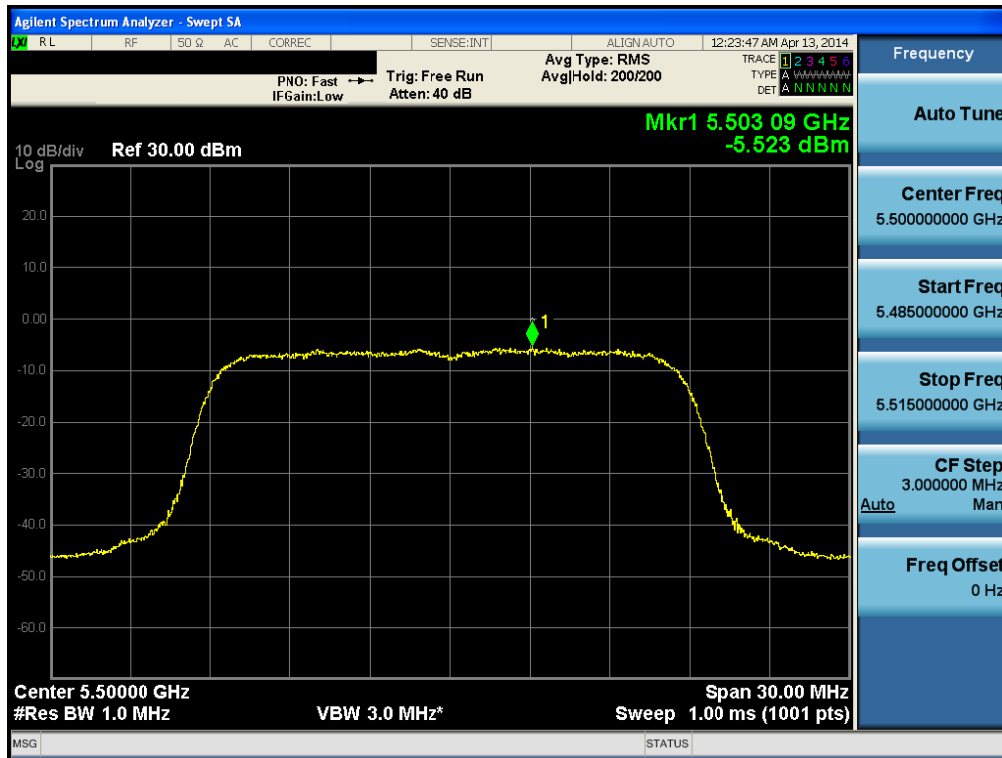
Peak Power Spectral Density

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



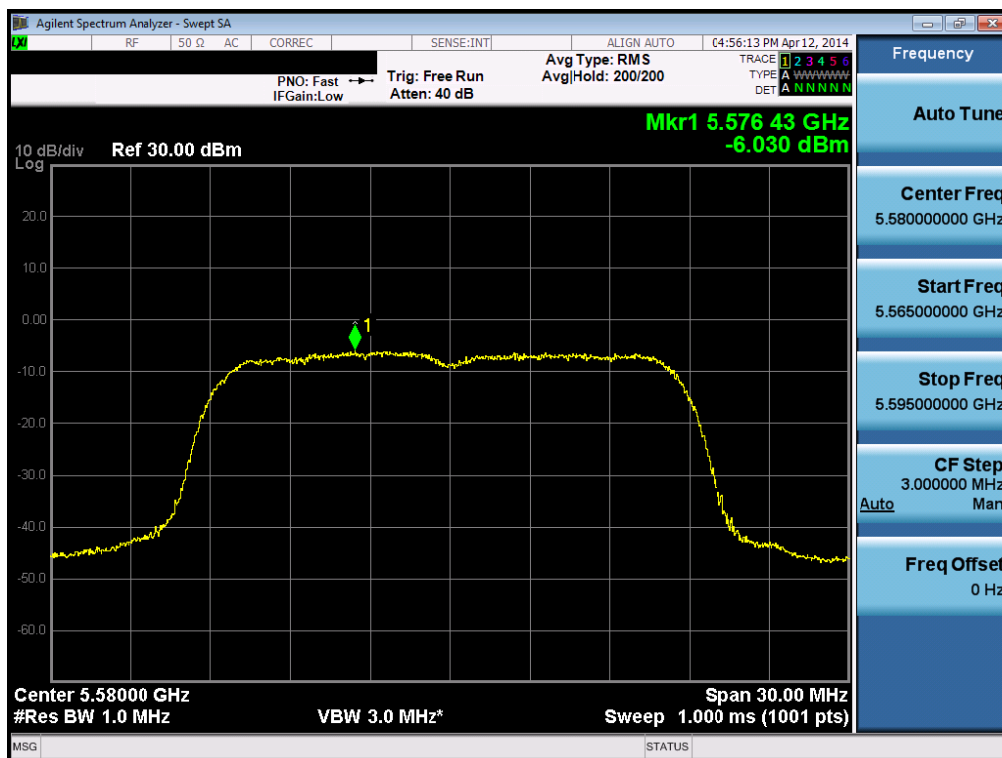
Peak Power Spectral Density

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



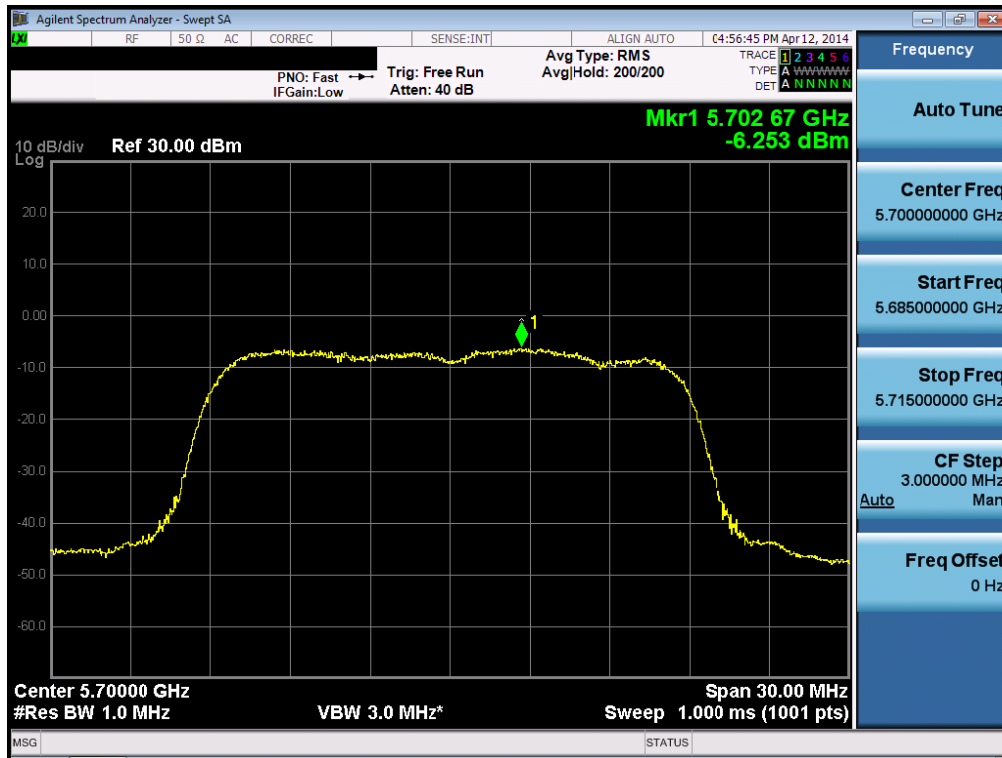
Peak Power Spectral Density

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



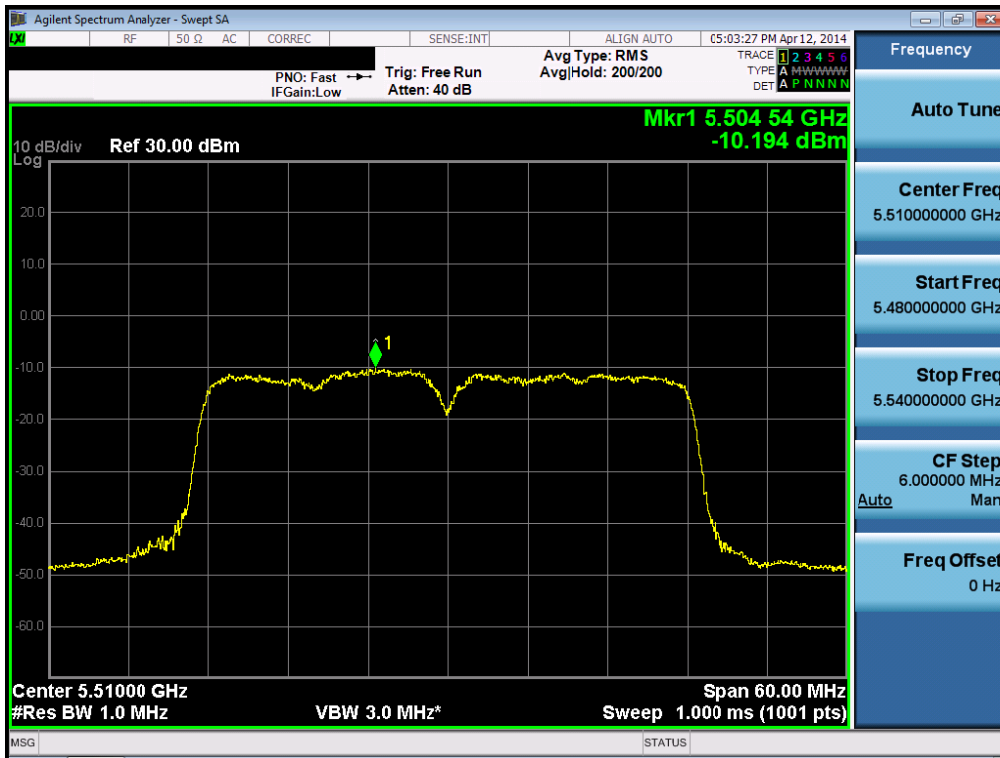
Peak Power Spectral Density

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



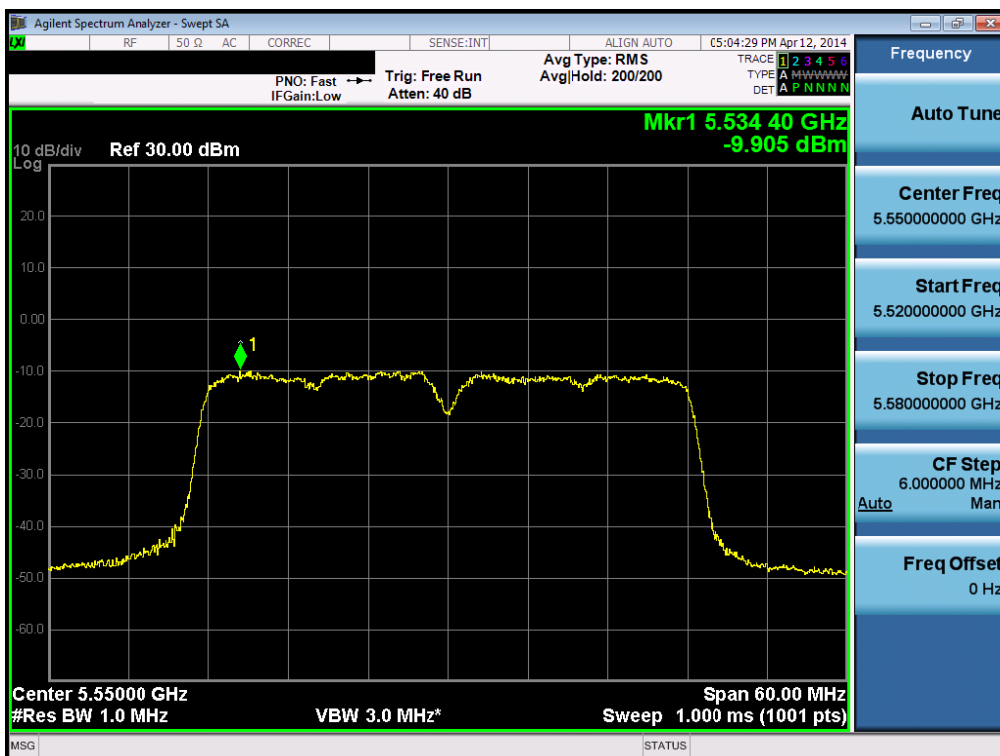
Peak Power Spectral Density

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



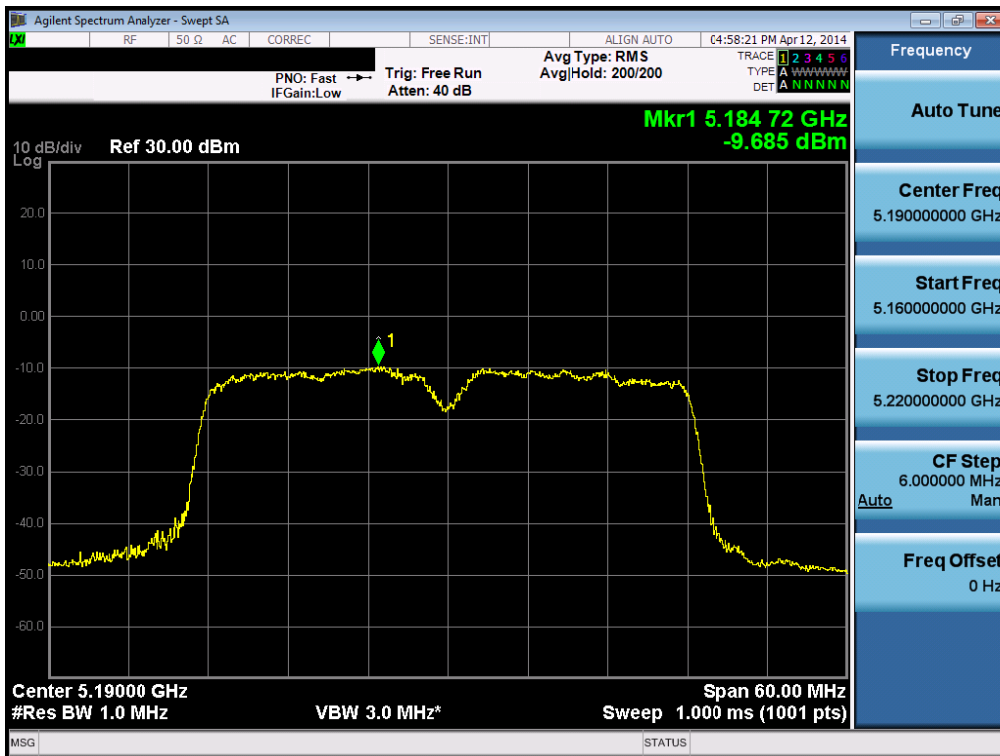
Peak Power Spectral Density

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



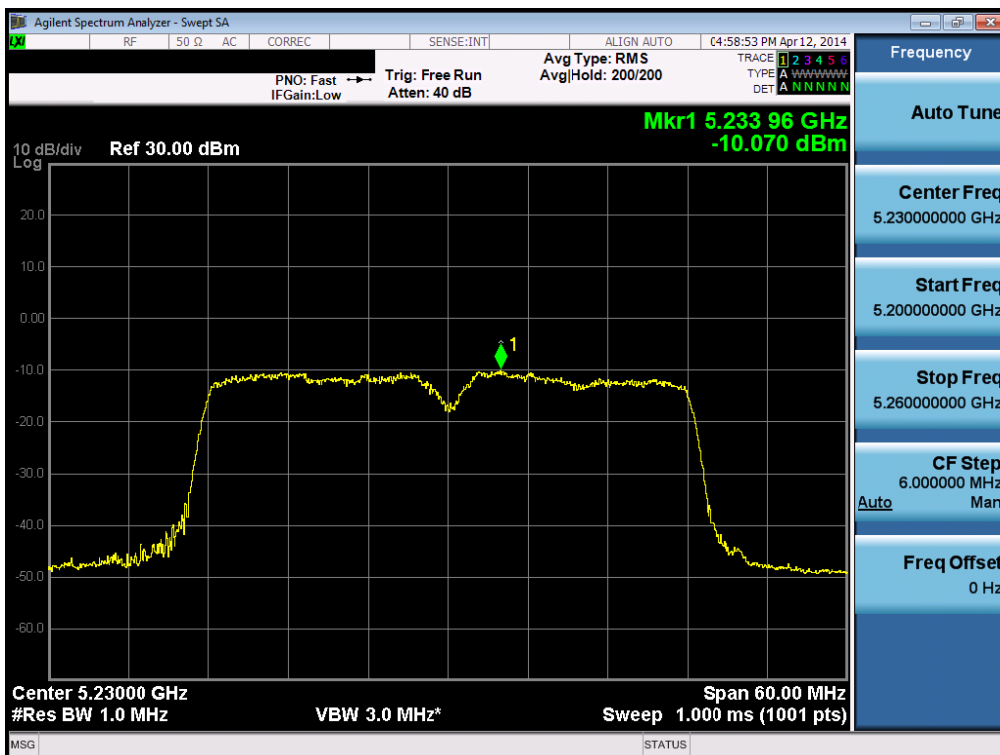
Peak Power Spectral Density

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



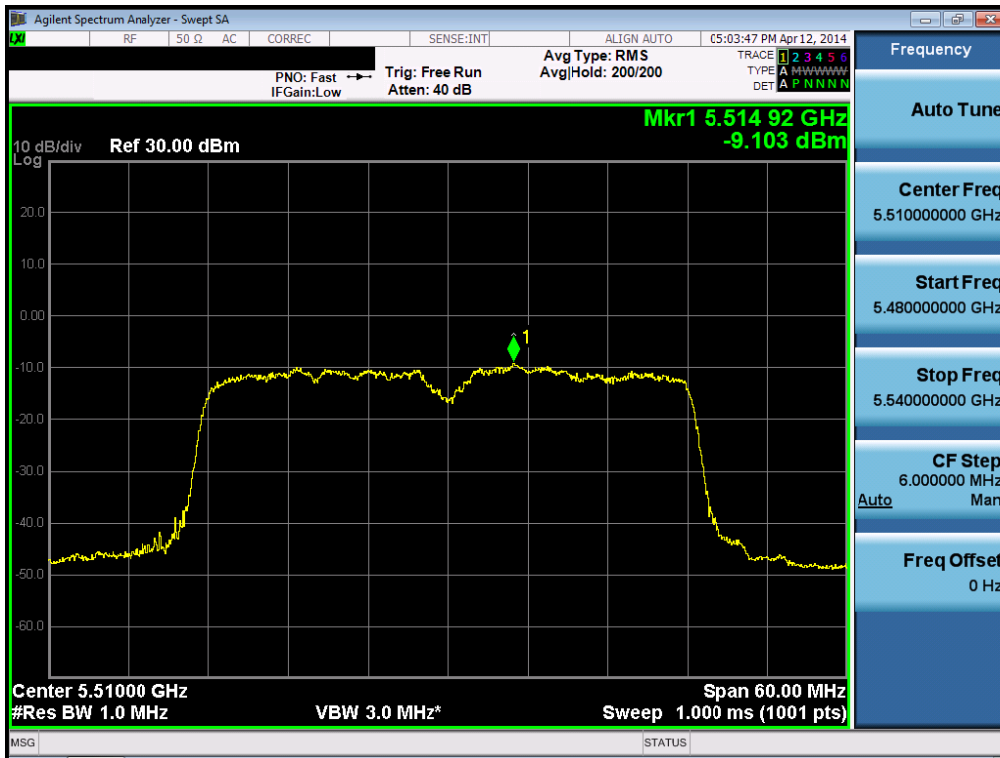
Peak Power Spectral Density

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



Peak Power Spectral Density

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



Peak Power Spectral Density

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

