TEST REPORT

Dt&C

DT&C Co., Ltd.

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

1. Report No : DRTFCC1701-0004(1)
2. Customer
   - Name : Code Corporation
   - Address : 12393 South Gateway Park Place Suite 600 Draper Utah United States 84020
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : Mobile Computer / CR4900
   FCC ID : QQ6-WBT11
5. Test Method Used : KDB 789033, ANSI C63.10-2013
   Test Specification : FCC Part 15.407 Subpart E
6. Date of Test : 2016-11-11 ~ 2016-11-25
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : JungWoo Kim (Signature)	Technical Manager Name : WonJung Lee (Signature)

2017 . 01 . 25 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1701-0004	Jan. 05, 2017	Initial issue
DRTFCC1701-0004(1)	Jan. 25, 2017	Separated the report for FCC and IC(Delete the IC).

CONTENTS

1. GENRAL INFORMATION

1.1 Testing Laboratory

DT&C Co., Ltd.			
Standard		**Site number**	**Address**
FCC	☒	**165783**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**804488**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**596748**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**678747**	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
IC	☐	**5740A-3**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**5740A-2**	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
www.dtnc.net			
Telephone	:	+ 82-31-321-2664	
FAX	:	+ 82-31-321-1664	

1.2 Tested environment

Ambient Condition	
▪ Temperature	+21 ~ +25 ℃
▪ Relative Humidity	34 % ~ 42 %

1.3 Measurement Uncertainty

Test items	Measurement uncertainty
Transmitter Output Power	0.71 dB (The confidence level is about 95 %, k = 2)
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

1.4 Details of Applicant

Applicant : Code Corporation
Address : 12393 South Gateway Park Place Suite 600 Draper Utah United States 84020
Contact person : Ryan Hoobler

1.5 Description of EUT

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
EUT	Mobile Computer
Model Name	CR4900
Add Model Name	N/A
Power Supply	DC 3.7V
Hardware version	MP
Software version	89.xx
Frequency Range	**U-NII 1(5150 ~ 5250 MHz)** ▪ 802.11a/n(HT20): 5180 ~ 5240 MHz ▪ 802.11n(HT40): 5190 ~ 5230 MHz **U-NII 2A(5250 ~ 5350 MHz)** ▪ 802.11a/n(HT20): 5260 ~ 5320 MHz ▪ 802.11n(HT40): 5270 ~ 5310 MHz **U-NII 2C(5470 ~ 5725 MHz)** ▪ 802.11a/n(HT20): 5500 ~ 5700 MHz ▪ 802.11n(HT40): 5510 ~ 5670 MHz **U-NII 3(5725 ~ 5850MHz)** ▪ 802.11a/n(HT20): 5745 ~ 5825 MHz ▪ 802.11n(HT40): 5755 ~ 5795 MHz
Modulation type	OFDM
Antenna Specification	**Antenna type**: Internal Antenna **Antenna gain** ▪ U-NII-1: 0.200 dBi ▪ U-NII 2A: 0.546 dBi ▪ U-NII 2C: -0.321 dBi ▪ U-NII-3: 0.176 dBi

2. Information about test items

2.1 Test mode

5GHz Band	Mode	Data Rate
U-NII 1	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
U-NII 2A	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
U-NII 2C	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
U-NII 3	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	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)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 1	36	5180	38	5190
	40	5200	-	-
	48	5240	46	5230
U-NII 2A	52	5260	54	5270
	60	5300	-	-
	64	5320	62	5310
U-NII 2C	100	5500	102	5510
	116	5580	110	5550
	140	5700	134	5670
U-NII 3	149	5745	151	5755
	157	5785	-	-
	165	5825	159	5795

2.3 Auxiliary equipment

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

2.4 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
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 MHz)		C
15.407(a)	Maximum Conducted Output Power	5150 ~ 5250 MHz : < 30 dBm or < 23.97 dBm 5250 ~ 5350 & 5470 ~ 5725 MHz : <250 mW or < 11 + 10 $\log_{10}$(B) dBm, whichever power is less. 5725 ~ 5850 MHz : < 30 dBm Note: B is the 26dB BW.		C Note 3
15.407(a)	Peak Power Spectral Density	5150 ~ 5250 MHz : 11 dBm/MHz or 17 dBm/MHz 5250 ~ 5350 & 5470 ~ 5725 MHz: 11 dBm/MHz 5725 ~ 5850 MHz: 30 dBm/500kHz		C Note 4
15.407(g)	Frequency Stability	N/A		C
15.407(b)	Undesirable Emissions	5150 ~ 5725 MHz: < -27 dBm/MHz EIRP 5725 ~ 5850 MHz: < -27 dBm/MHz or < 10 dBm/MHz or 15.6 dBm/MHz < 27dBm/MHz EIRP	Radiated	C Note 5
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	FCC 15.407(h)	Conducted	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 and ANSI C63.10-2013.

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

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

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

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

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

Note 6: 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 v01r03. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

4.1 EUT configuration

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

4.2 EUT exercise

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

4.3 General test procedures

Conducted Emissions

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

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

Radiated Emissions

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

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

6.1 According to FCC 47 CFR §15.203:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The internal antenna is attached on the main PCB using the special spring tension. (Refer to Internal Photo file.)
Therefore this E.U.T Complies with the requirement of §15.203

7. TEST RESULT

7.1 Emission Bandwidth (26 dB Bandwidth)

▣ Test Requirements

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

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

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

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW.
2. Set the video bandwidth **(VBW) > RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.
   Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

▣ **Test Results: Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 1	36	5180	24.70
		40	5200	25.70
		48	5240	21.67
	U-NII 2A	52	5260	22.60
		60	5300	22.07
		64	5320	21.96
	U-NII 2C	100	5500	21.65
		116	5580	21.62
		140	5700	21.88
802.11n (HT20)	U-NII 1	36	5180	22.20
		40	5200	22.19
		48	5240	21.71
	U-NII 2A	52	5260	21.82
		60	5300	22.06
		64	5320	22.05
	U-NII 2C	100	5500	21.68
		116	5580	21.73
		140	5700	22.42
802.11n (HT40)	U-NII 1	38	5190	46.54
		46	5230	45.07
	U-NII 2A	54	5270	43.93
		62	5310	43.26
	U-NII 2C	102	5510	43.21
		110	5550	43.17
		134	5670	43.02

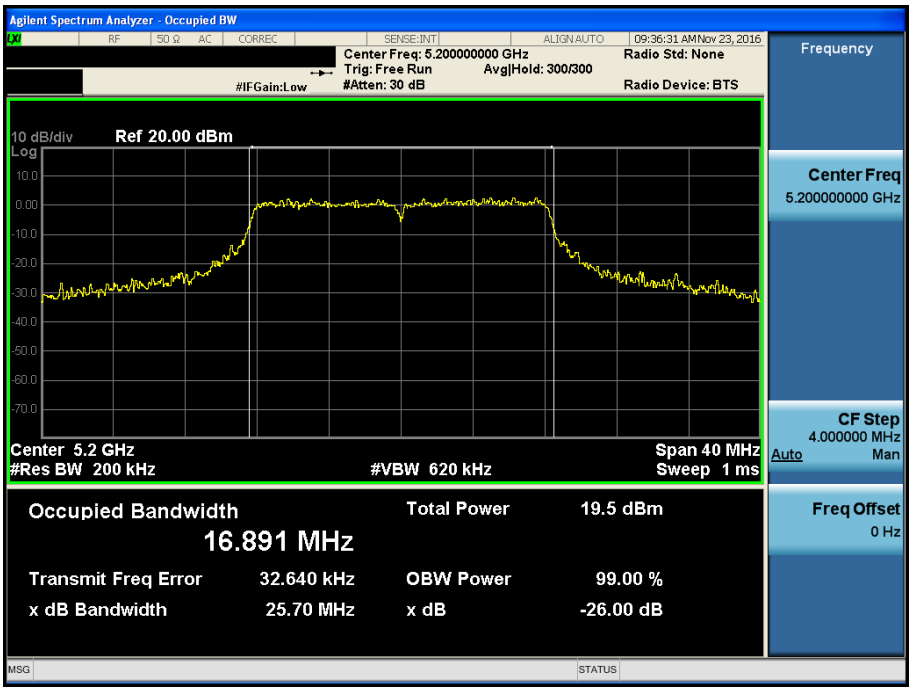
▣ Result Plots

26 dB Bandwidth

Test Mode: 802.11a & Ch.36

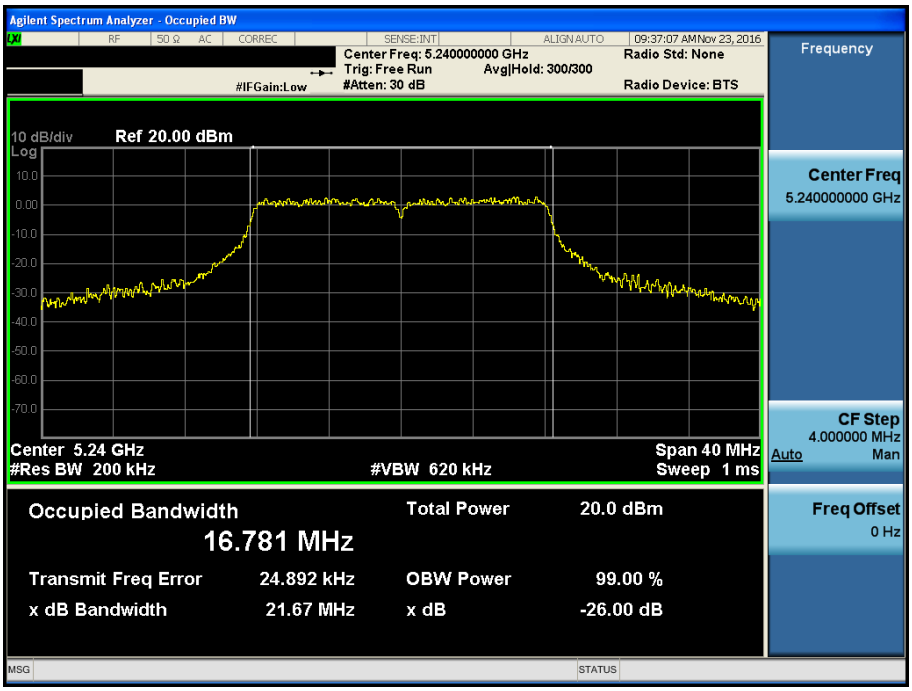
26 dB Bandwidth

Test Mode: 802.11a & Ch.40



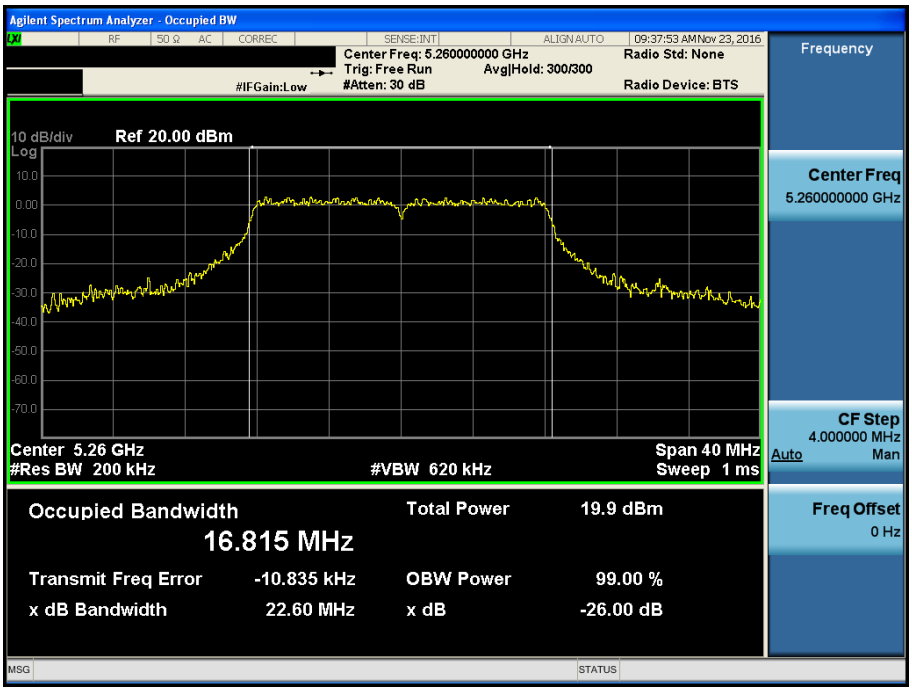
26 dB Bandwidth

Test Mode: 802.11a & Ch.48



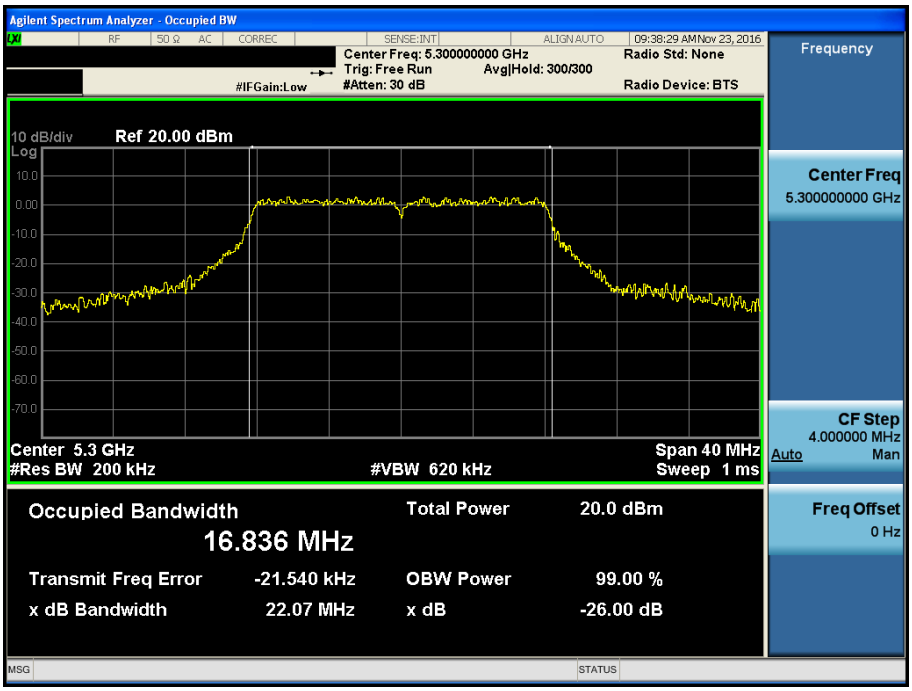
26 dB Bandwidth

Test Mode: 802.11a & Ch.52



26 dB Bandwidth

Test Mode: 802.11a & Ch.60

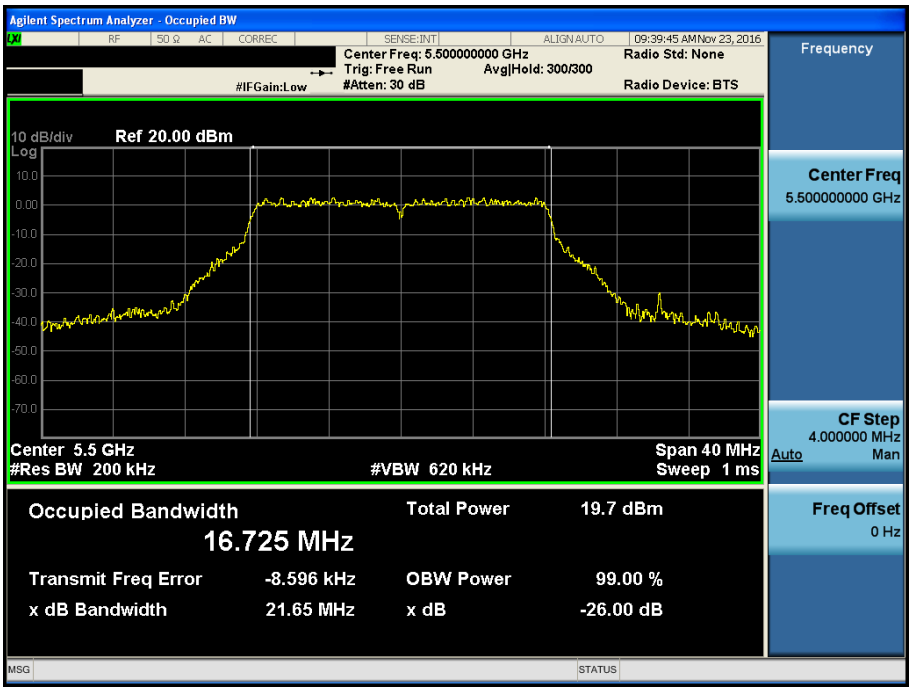


26 dB Bandwidth

Test Mode: 802.11a & Ch.64

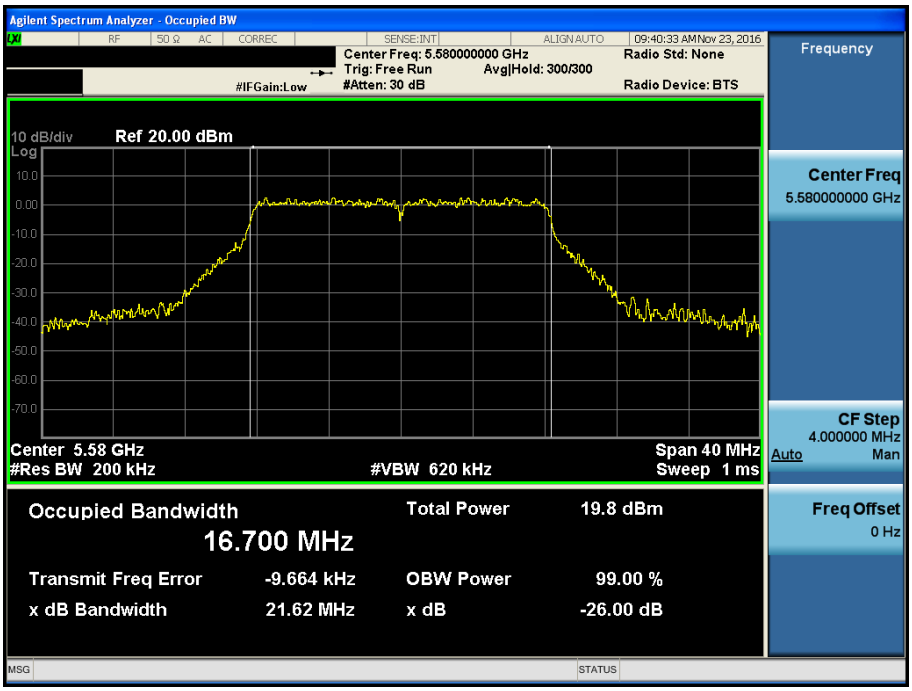
26 dB Bandwidth

Test Mode: 802.11a & Ch.100



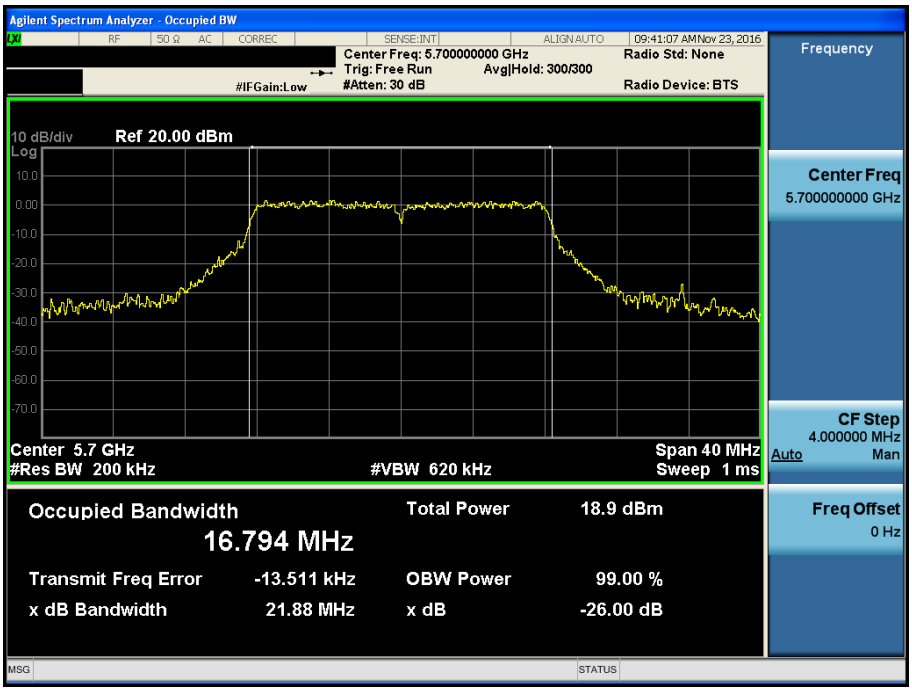
26 dB Bandwidth

Test Mode: 802.11a & Ch.116



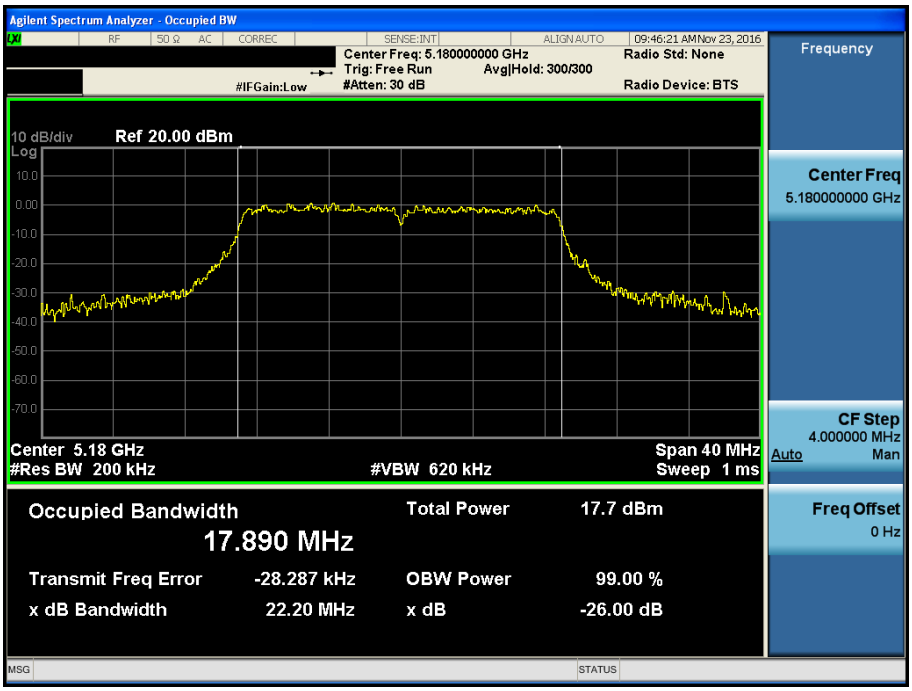
26 dB Bandwidth

Test Mode: 802.11a & Ch.140



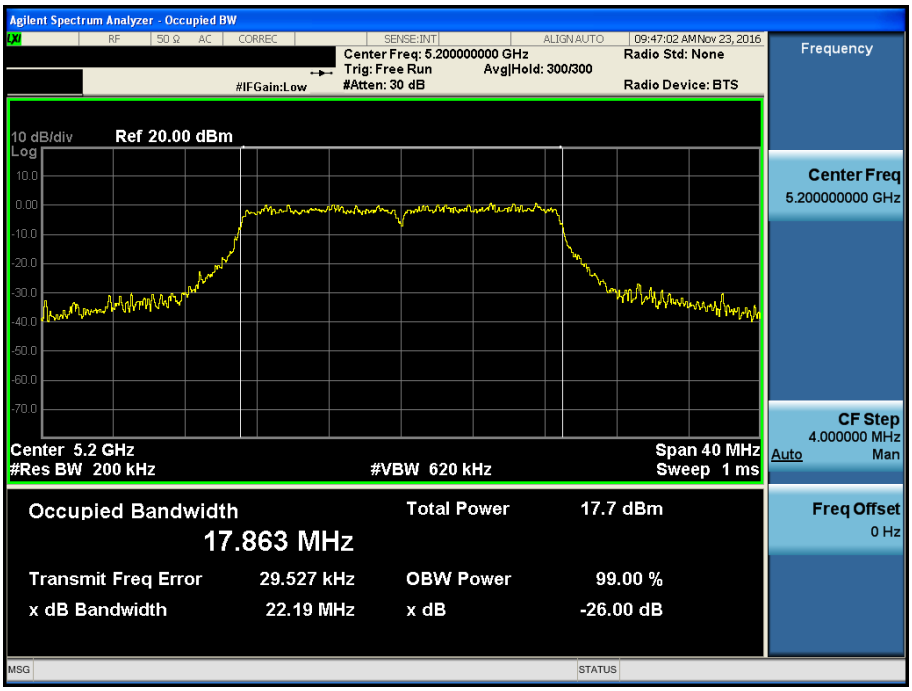
26 dB Bandwidth

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



26 dB Bandwidth

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



26 dB Bandwidth

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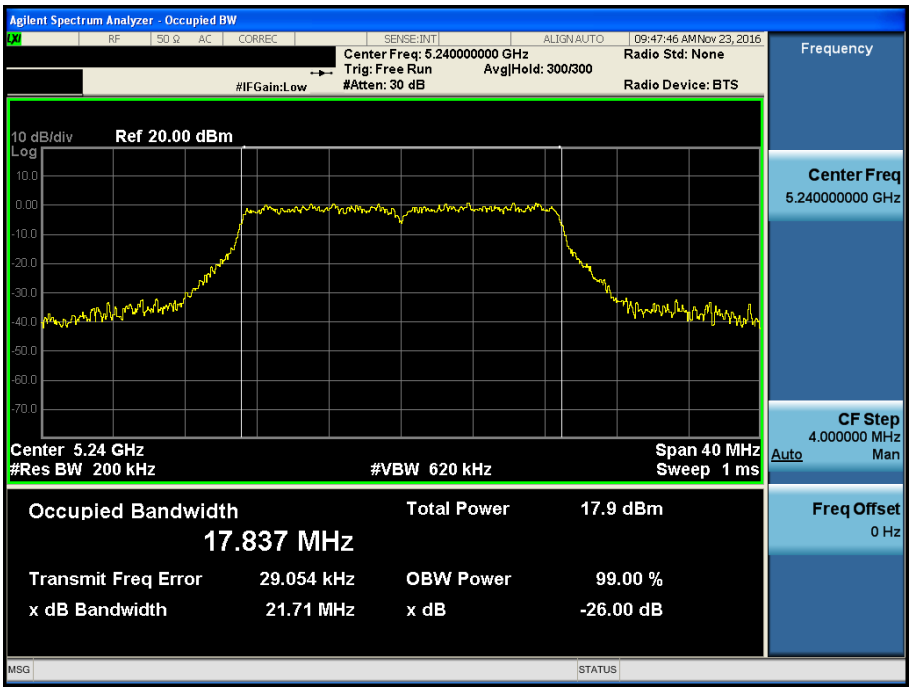

26 dB Bandwidth

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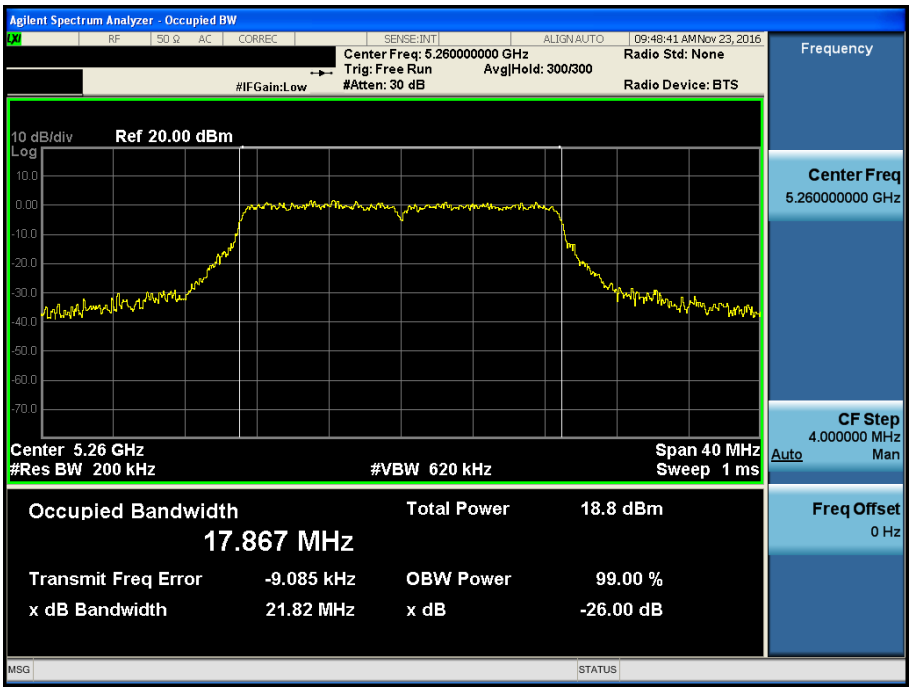
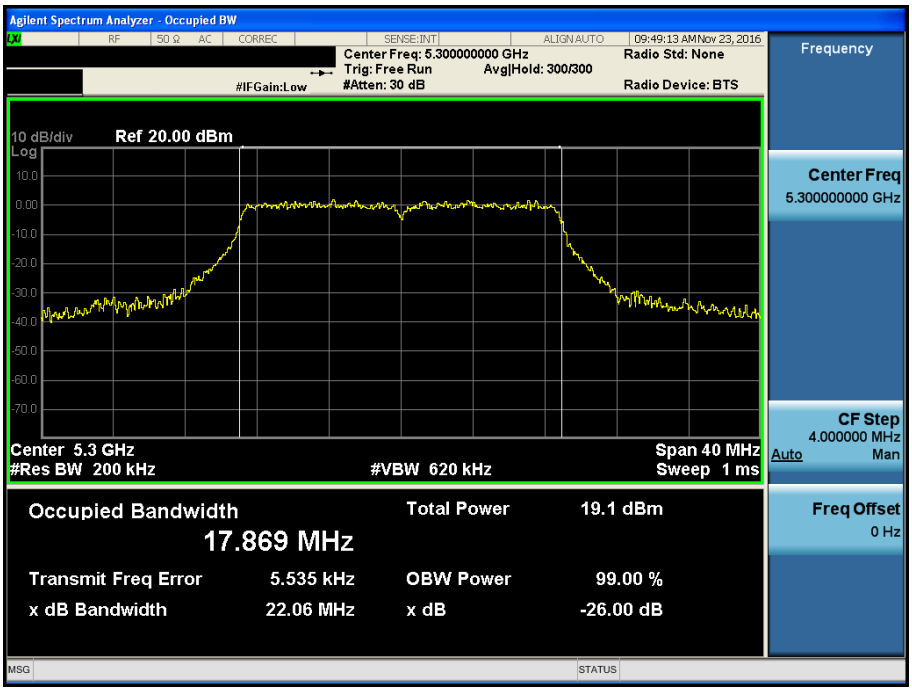


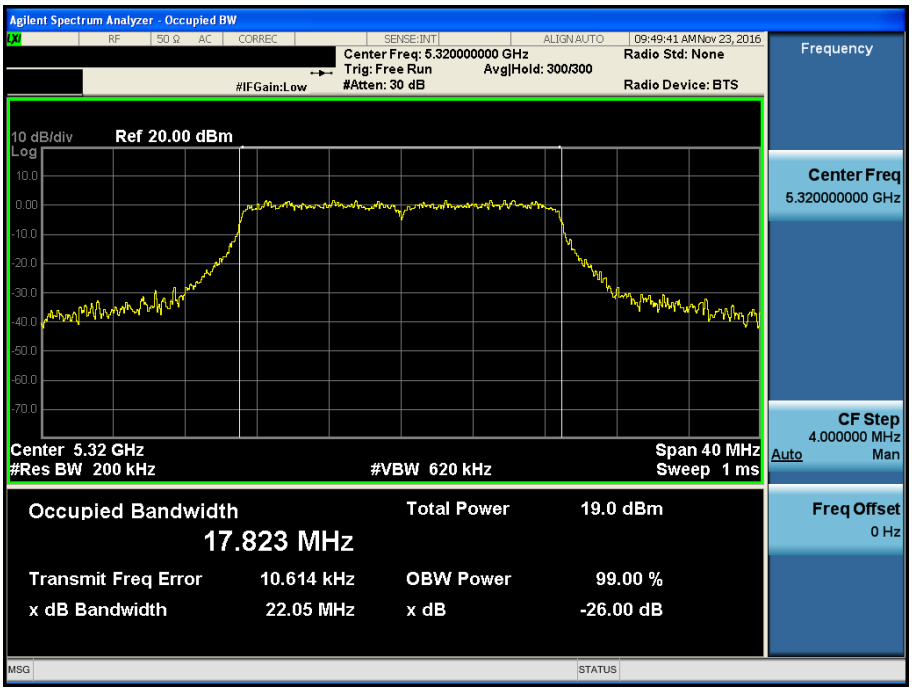
26 dB Bandwidth

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



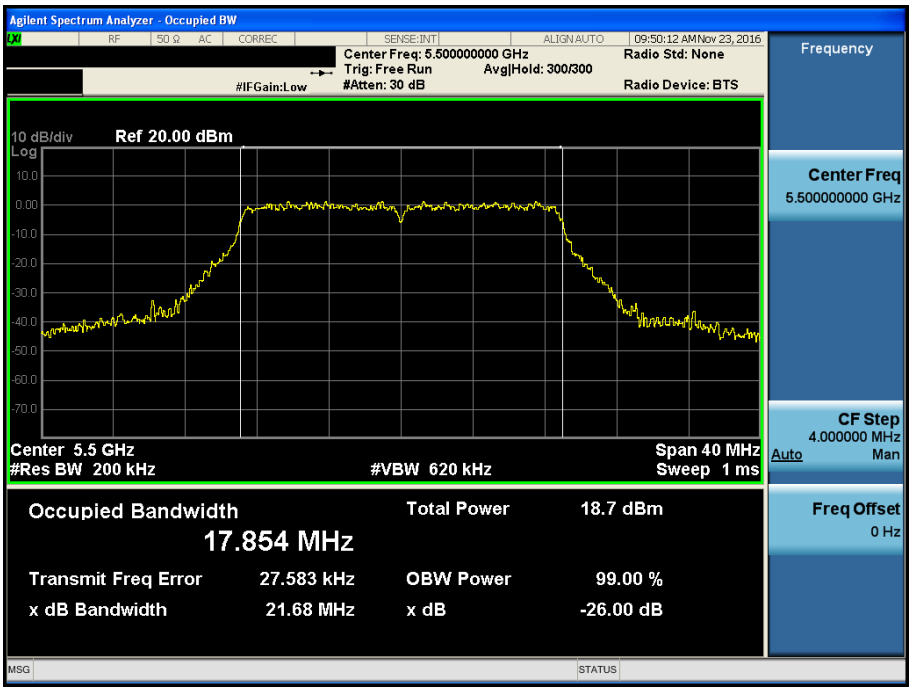
26 dB Bandwidth

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



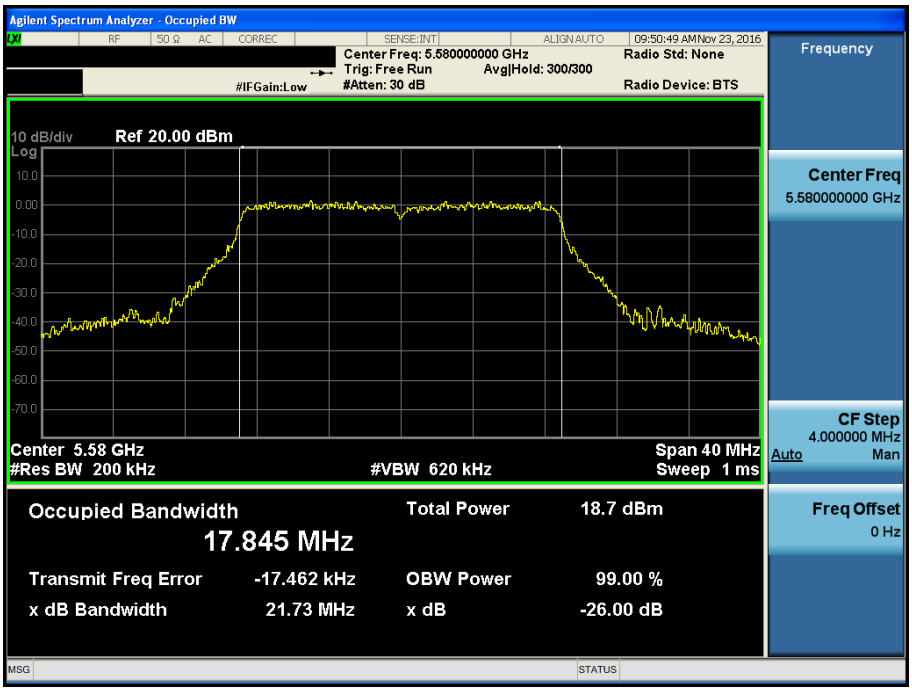
26 dB Bandwidth

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



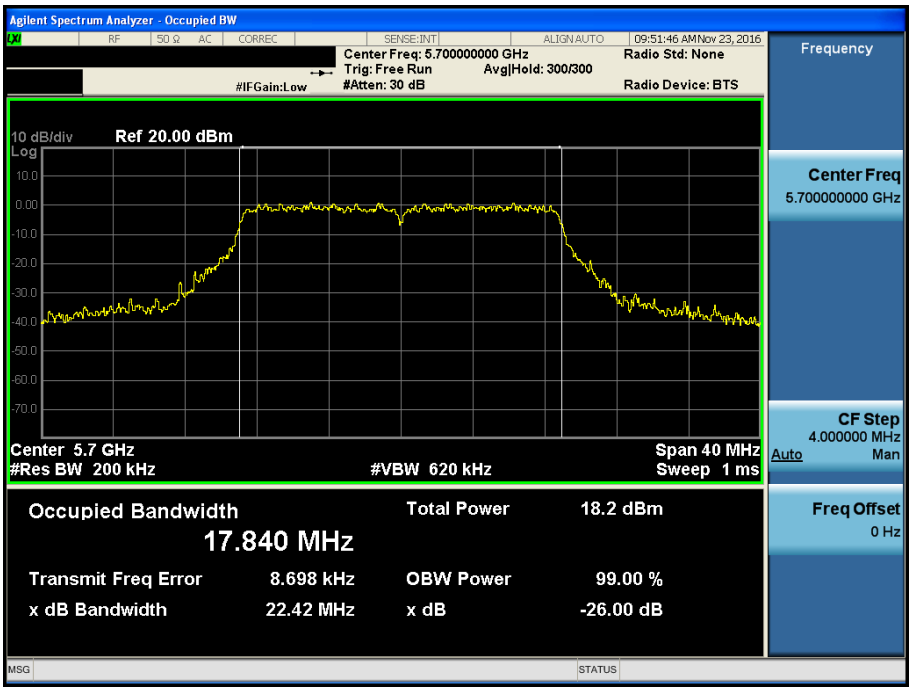
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.116



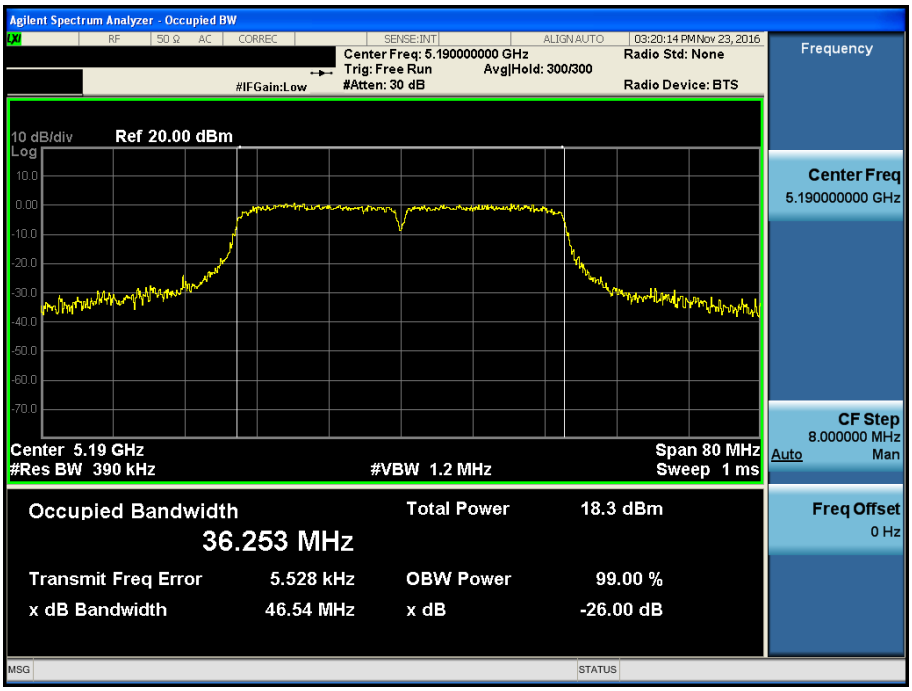
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.140



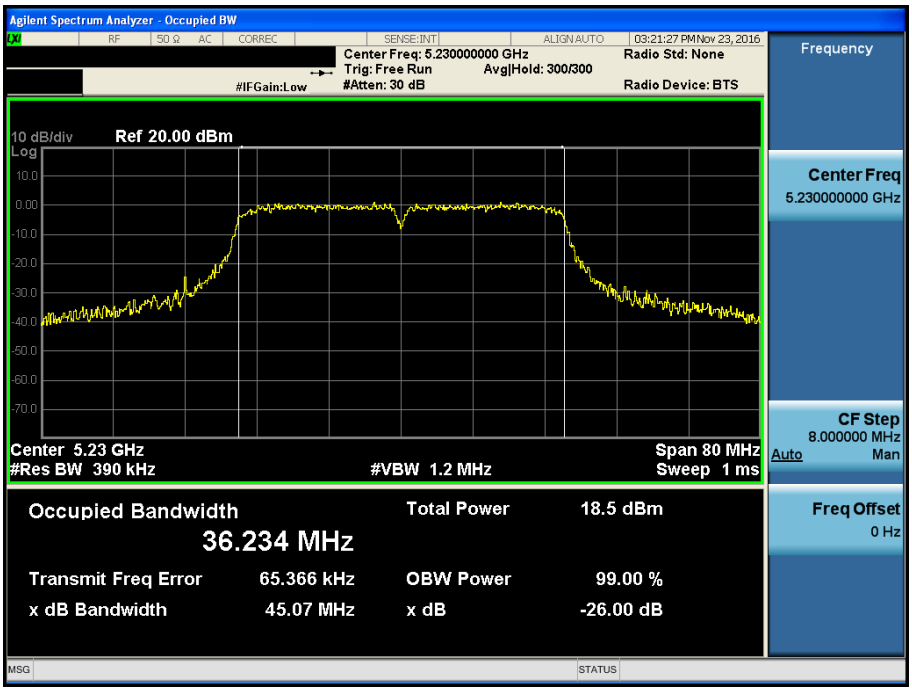
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.38



26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.46

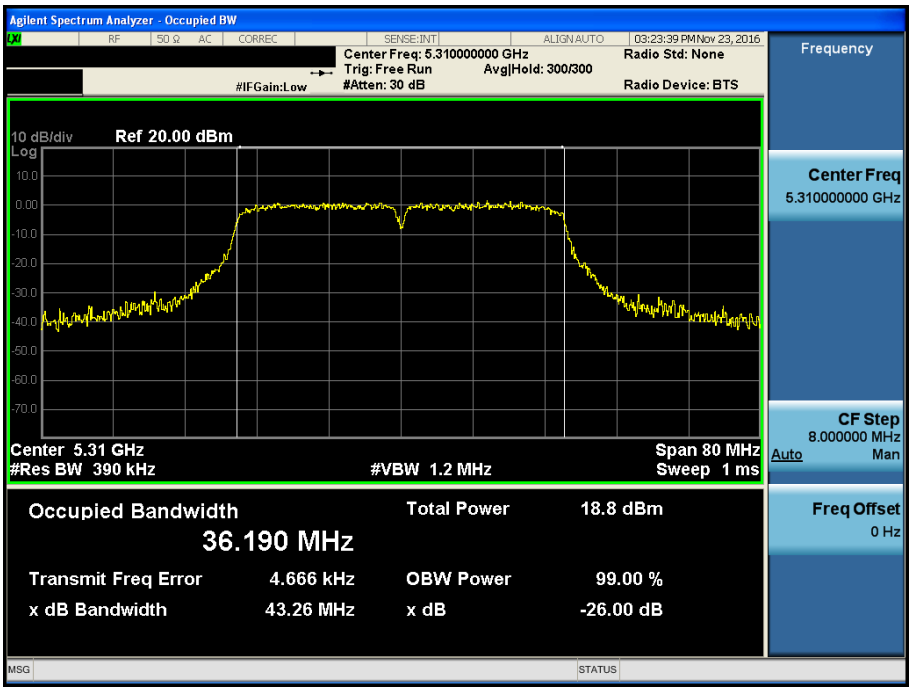


26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.54

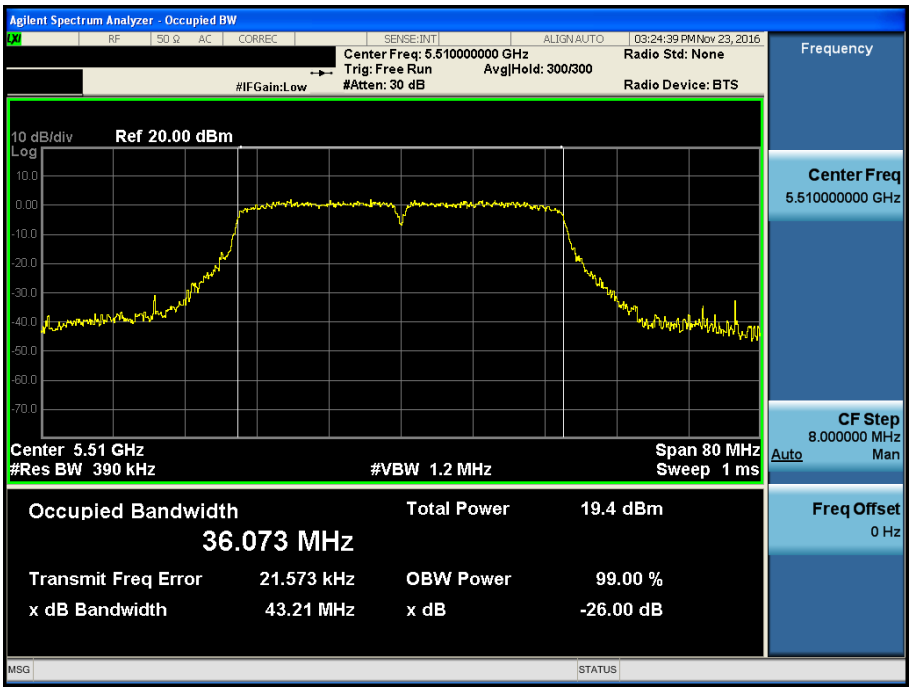
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.62



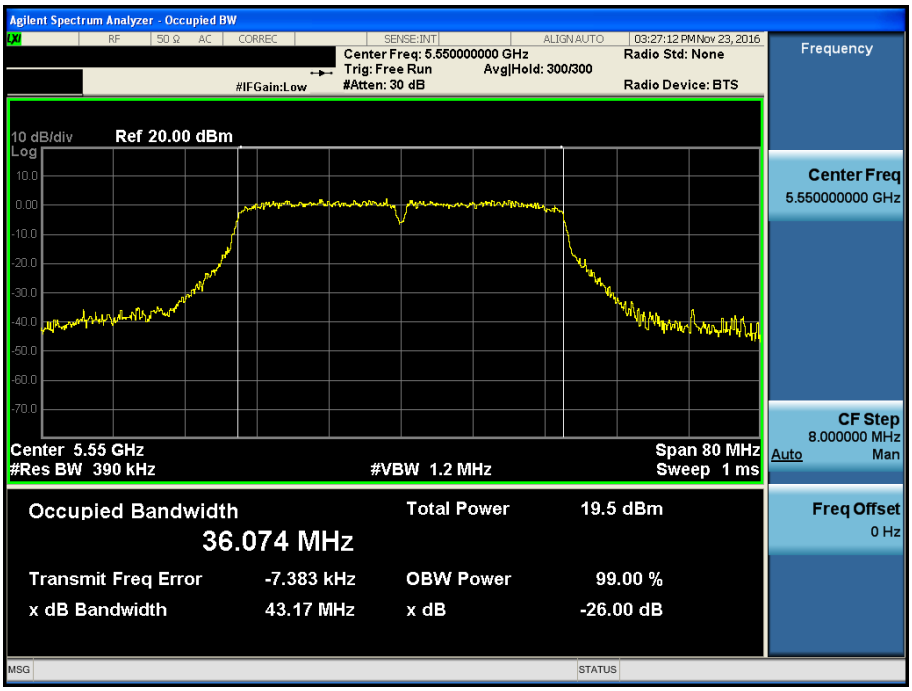
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.102



26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.110



26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.134

7.2 Minimum Emission Bandwidth (6 dB Bandwidth)

▣ Test Requirements

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

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

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

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth **≥ 3 x 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.

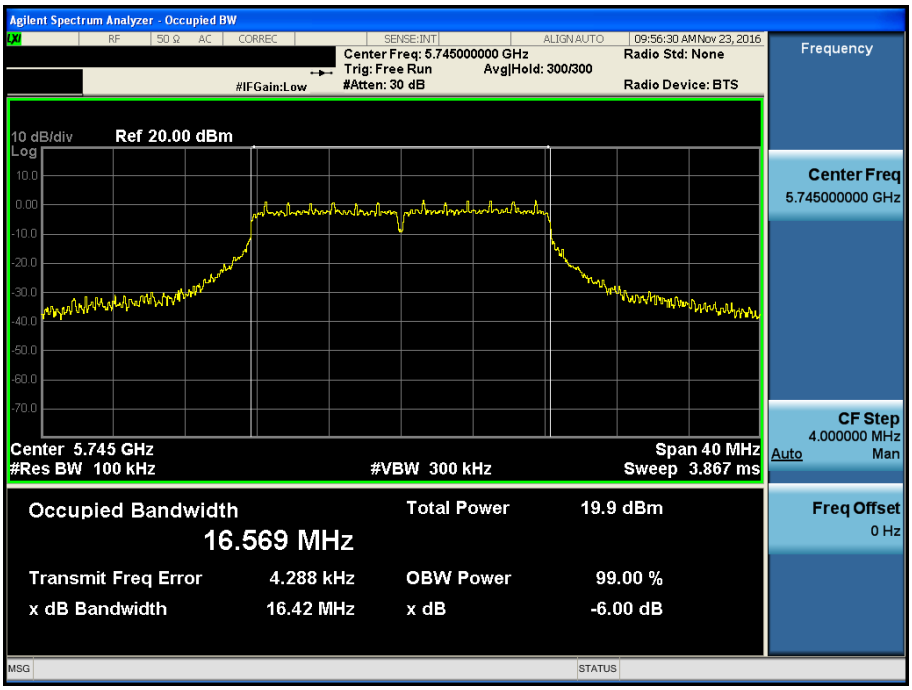
▣ Test Results: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 3	149	5745	16.42
		157	5785	16.39
		165	5825	16.38
802.11n (HT20)	U-NII 3	149	5785	17.62
		157	5825	17.62
		165	5755	17.60
802.11n (HT40)	U-NII 3	151	5745	35.22
		159	5785	35.23

▣ RESULT PLOTS

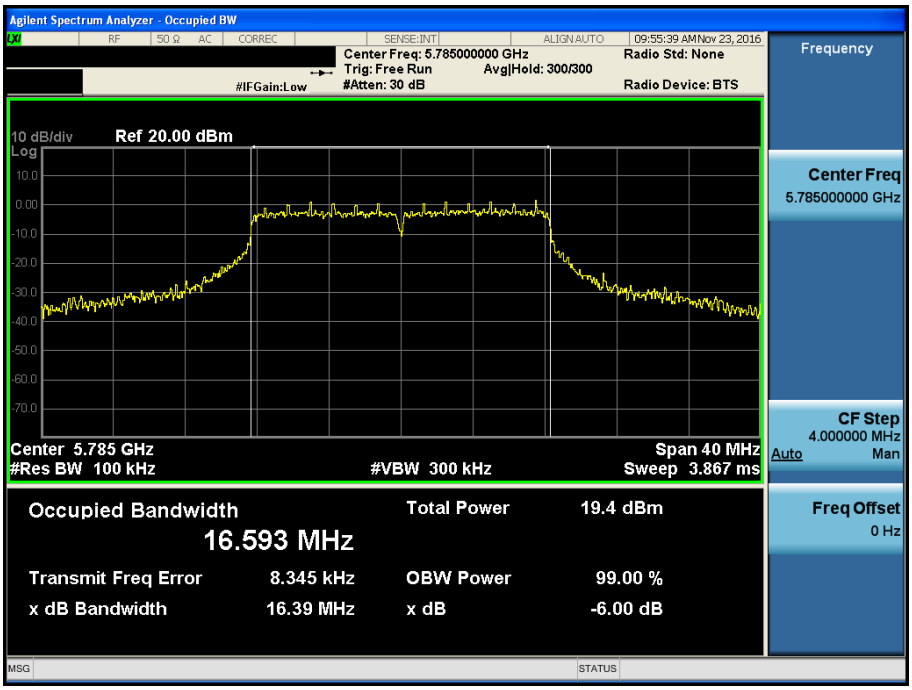
6 dB Bandwidth

Test Mode: 802.11a & Ch.149



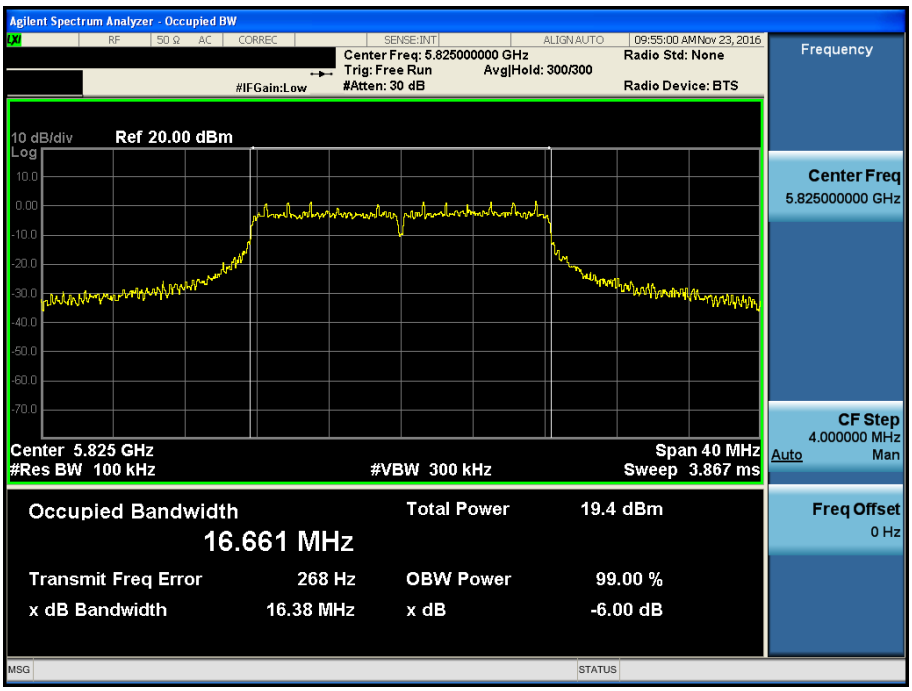
6 dB Bandwidth

Test Mode: 802.11a & Ch.157



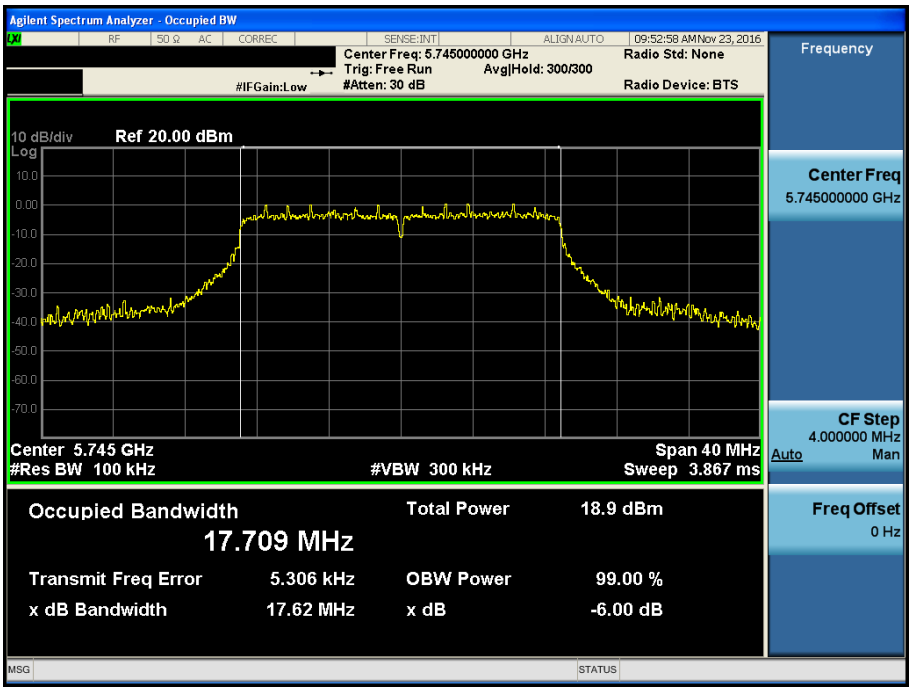
6 dB Bandwidth

Test Mode: 802.11a & Ch.165



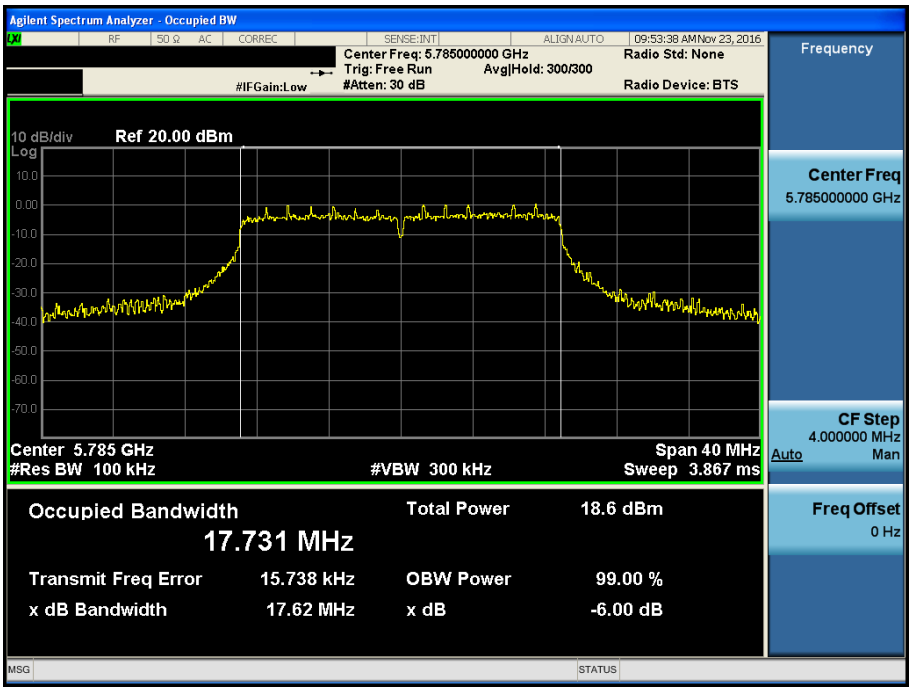
6 dB Bandwidth

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



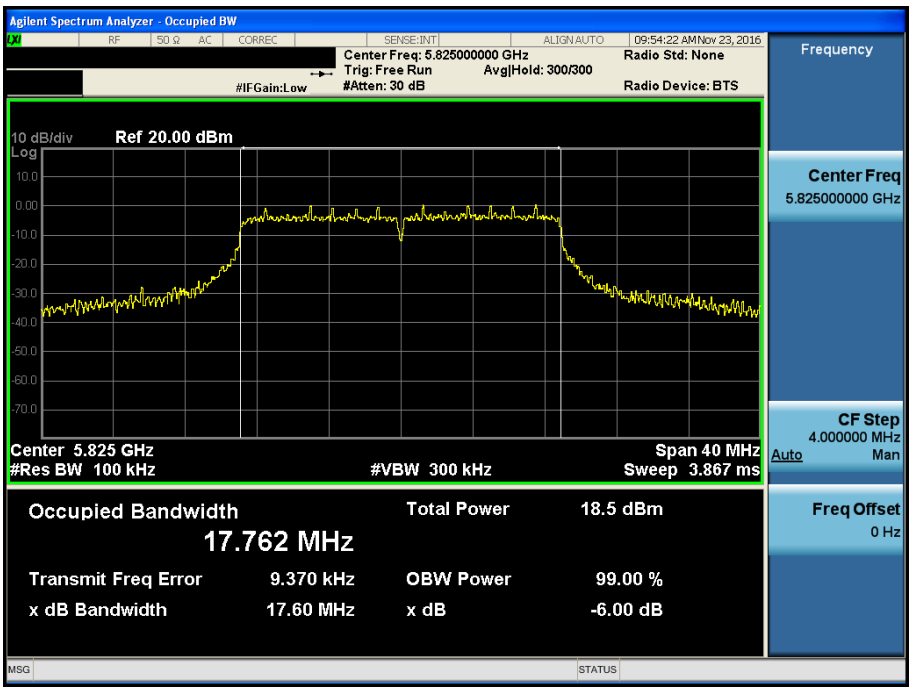
6 dB Bandwidth

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



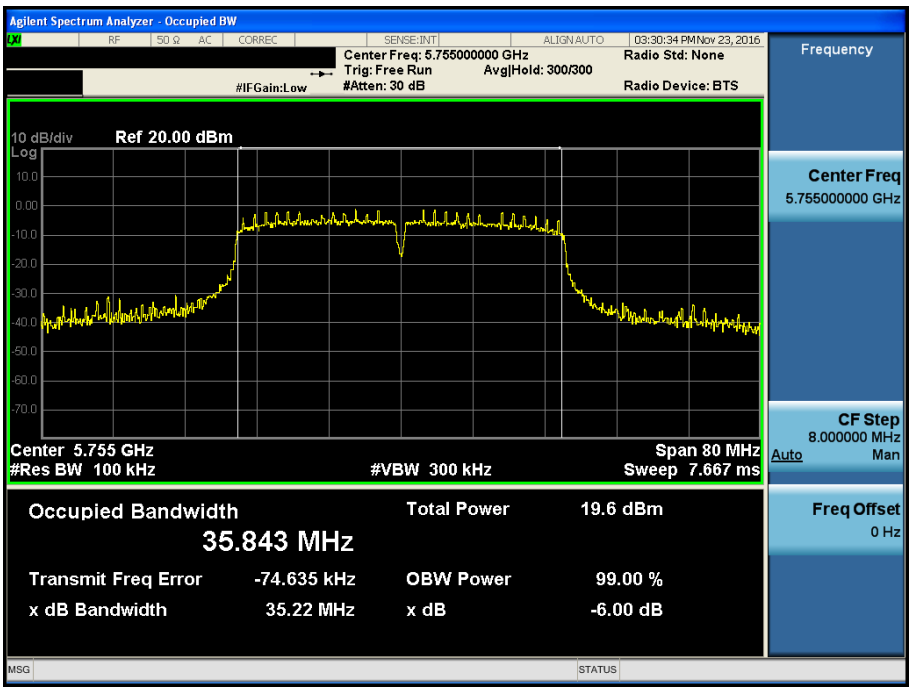
6 dB Bandwidth

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



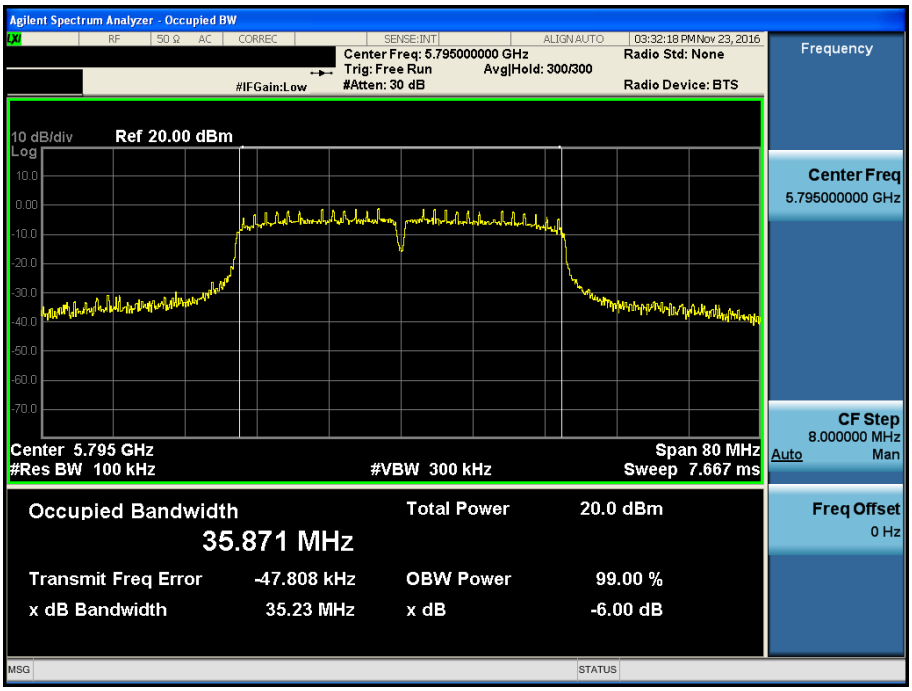
6 dB Bandwidth

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



6 dB Bandwidth

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



7.3 Maximum Conducted Output Power

▣ **Test Requirements, Part. 15.407(a)**

(1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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

(2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

- Output power Limit Calculation(FCC)

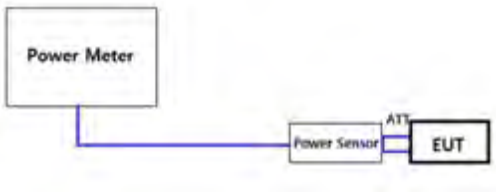
Band	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 1	802.11a	250	23.97	0.200	**23.97**
	802.11n(HT20)				
	802.11n(HT40)				

Band	Mode	Power Limit [mW] / Least 26 dBc BW [MHz]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 2A	802.11a	250	23.97	0.546	**23.38**
		17.334	23.38		
	802.11n(HT20)	250	23.97		**23.60**
		18.217	23.60		
	802.11n(HT40)	250	23.97		**23.97**
		36.368	26.60		

Band	Mode	Power Limit [mW] / Least 26 dBc BW [MHz]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 2C	802.11a	250	23.97	-0.321	**23.36**
		17.251	23.36		
	802.11n(HT20)	250	23.97		**23.60**
		18.223	23.60		
	802.11n(HT40)	250	23.97		**23.97**
		43.020	27.33		

Band	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 3	802.11a	1000	30.00	0.176	**30.00**
	802.11n(HT20)				
	802.11n(HT40)				

▣ Test Configuration



Method PM-G

▣ Test Procedure

Method PM-G of KDB789033 D02

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

▣ Test Results: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result [dBm]
802.11a	U-NII 1	36	5180	13.080
		40	5200	13.230
		48	5240	12.990
	U-NII 2A	52	5260	13.430
		60	5300	13.330
		64	5320	13.180
	U-NII 2C	100	5500	12.840
		116	5580	12.780
		140	5700	12.410
	U-NII 3	149	5745	11.680
		157	5785	11.660
		165	5825	11.540
802.11n HT20	U-NII 1	36	5180	11.680
		40	5200	11.660
		48	5240	11.540
	U-NII 2A	52	5260	12.390
		60	5300	12.150
		64	5320	12.080
	U-NII 2C	100	5500	11.840
		116	5580	11.490
		140	5700	11.510
	U-NII 3	149	5745	11.700
		157	5785	11.590
		165	5825	11.310
802.11n HT40	U-NII 1	38	5190	12.050
		46	5230	11.780
	U-NII 2A	54	5270	11.770
		62	5310	11.610
	U-NII 2C	102	5510	11.550
		110	5550	11.630
		134	5670	11.590
	U-NII 3	151	5755	11.520
		159	5795	11.620

7.4 Maximum Power Spectral Density

▣ **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 power spectral density shall not exceed 17 dBm in any 1MHz band. note1

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

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

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

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

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

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

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

- Peak Power Spectral Density Limit Calculation

Band	Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 1	11	0.200	11
U-NII 2A	11	0.546	11
U-NII 2C	11	-0.321	11
U-NII 3	30	0.176	30

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

Maximum 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 or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)

2) Use the peak search function on the instrument to find the peak of the spectrum and record its value.

3) Make the following adjustments to the peak value of the spectrum, if applicable:
a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.
b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

4) The result is the Maximum PSD over 1 MHz reference bandwidth.

5) For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.1.a). (Refer to Appendix II)

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

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

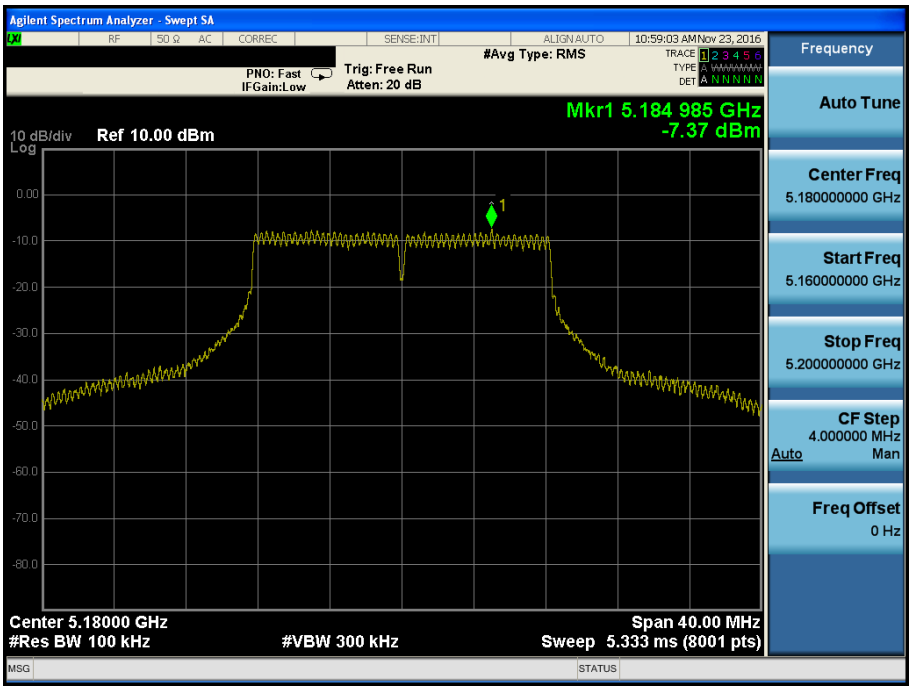
▣ **Test result: Comply**

Mode	Band	Channel	Frequency [MHz]	Reading [dBm]	T.F Note 1 [dB]	Test Result [dBm]
802.11a	U-NII 1	36	5180	-7.37	10.61	3.24
		40	5200	-7.83		2.78
		48	5240	-7.71		2.90
	U-NII 2A	52	5260	-7.44		3.17
		60	5300	-7.22		3.39
		64	5320	-7.14		3.47
	U-NII 2C	100	5500	-7.48		3.13
		116	5580	-7.69		2.92
		140	5700	-8.39		2.22
	U-NII 3	149	5745	-7.80	7.60	-0.20
		157	5785	-7.91		-0.31
		165	5825	-8.26		-0.66
802.11n (HT20)	U-NII 1	36	5180	-9.68	10.66	0.98
		40	5200	-10.02		0.64
		48	5240	-9.25		1.41
	U-NII 2A	52	5260	-8.94		1.72
		60	5300	-8.32		2.34
		64	5320	-8.58		2.08
	U-NII 2C	100	5500	-8.76		1.90
		116	5580	-8.32		2.34
		140	5700	-9.49		1.17
	U-NII 3	149	5745	-8.89	7.65	-1.24
		157	5785	-8.96		-1.31
		165	5825	-9.18		-1.53
802.11n (HT40)	U-NII 1	38	5190	-12.49	11.20	-1.29
		46	5230	-12.48		-1.28
	U-NII 2A	54	5270	-12.00		-0.80
		62	5310	-12.12		-0.92
	U-NII 2C	102	5510	-11.04		0.16
		110	5550	-11.11		0.09
		134	5670	-12.22		-1.02
	U-NII 3	151	5755	-11.38	8.19	-3.19
		159	5795	-11.04		-2.85

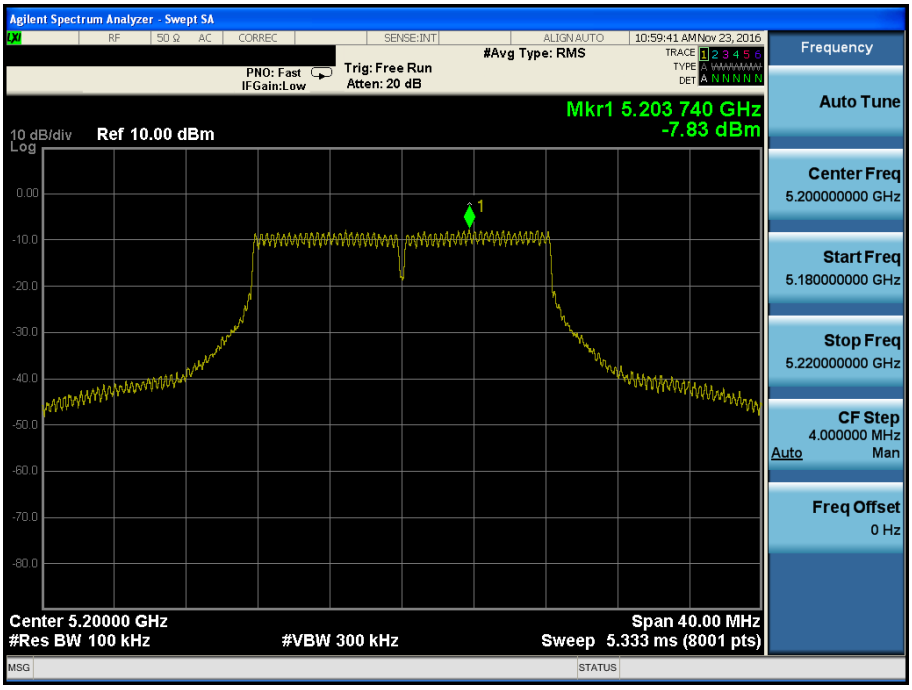
Note 1: "U-NII 1, 2A, 2C [T.F] = 10*LOG(1MHz/100kHz) + DCCF"
"U-NII 3 [T.F] = 10*LOG(500kHz/100kHz) + DCCF"
For DCCF(Duty Cycle Correction Factor) please refer to appendix II.
Note 2: Test Result = Measurement Data + T.F

▣ RESULT PLOTS

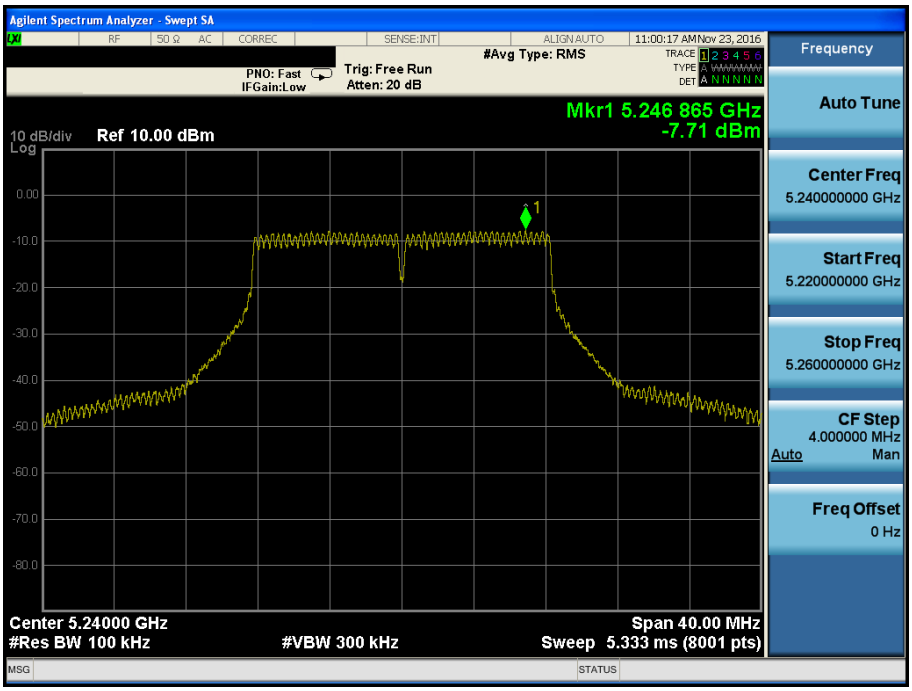
Maximum Power Spectral Density Test Mode: 802.11a & Ch.36



Maximum Power Spectral Density Test Mode: 802.11a & Ch.40

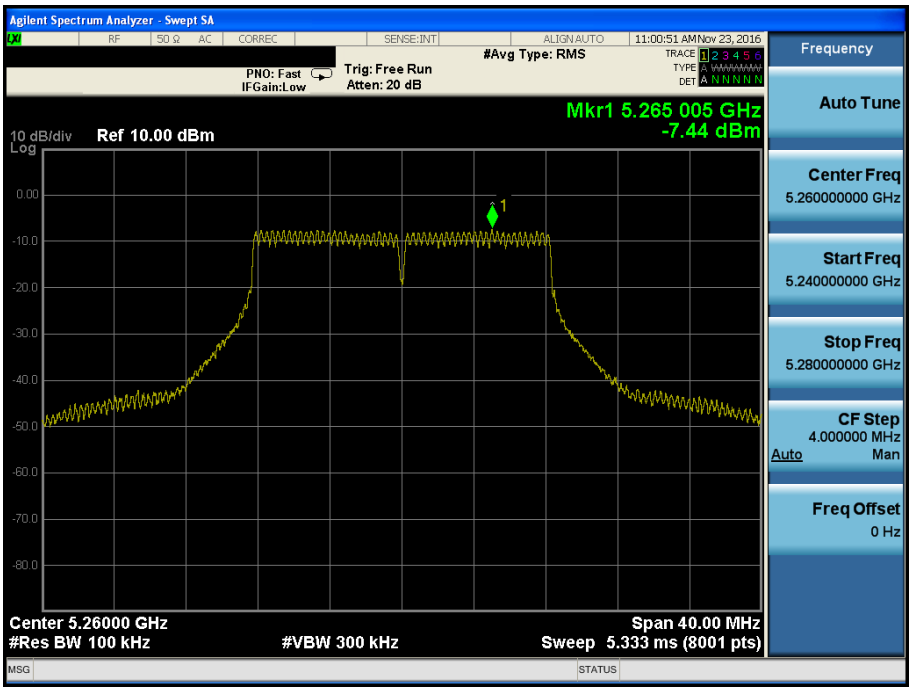


Maximum Power Spectral Density Test Mode: 802.11a & Ch.48



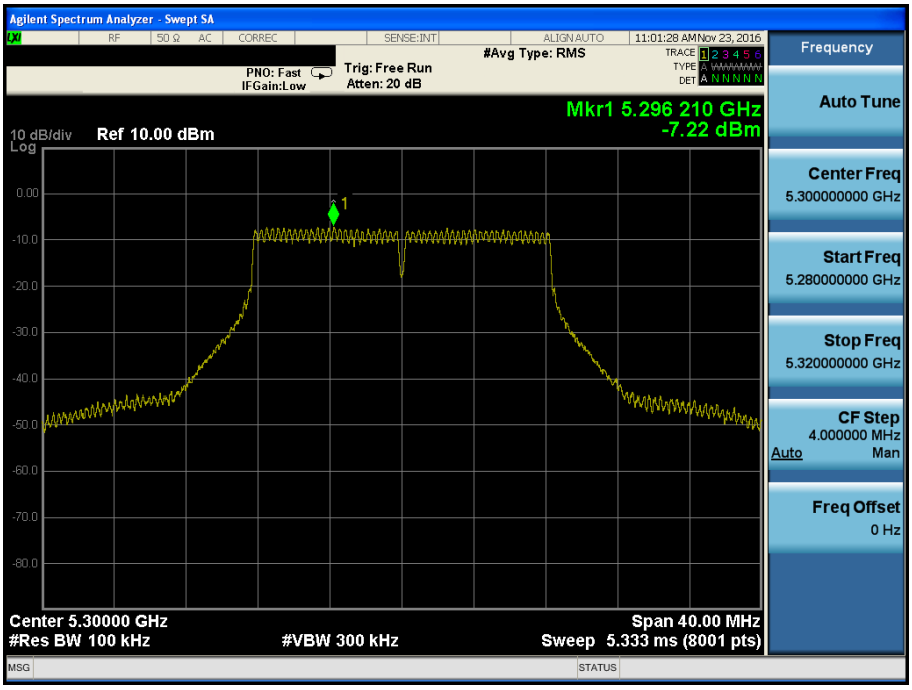
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.52

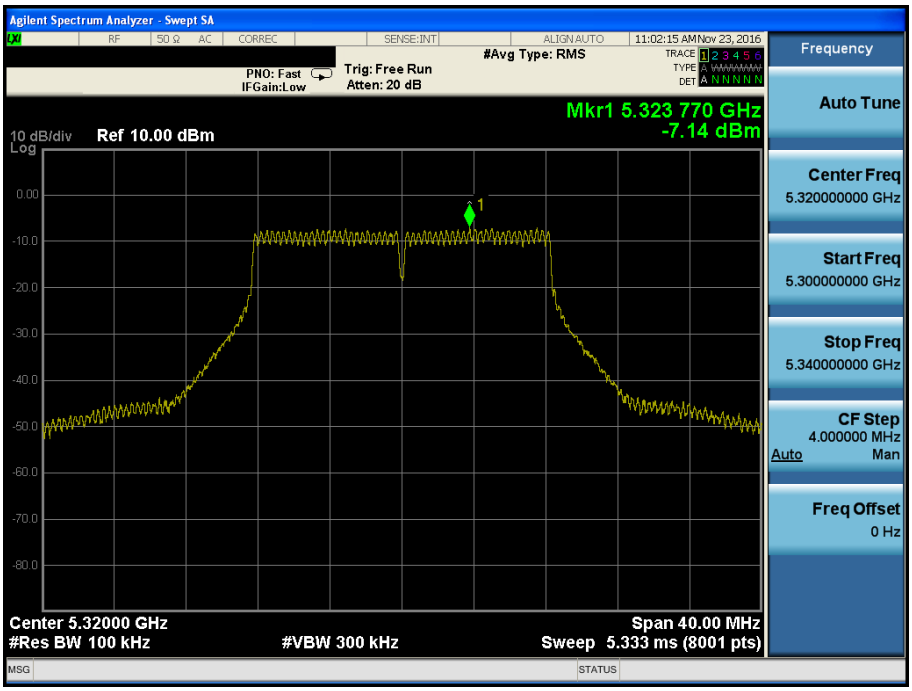


Maximum Power Spectral Density

Test Mode: 802.11a & Ch.60

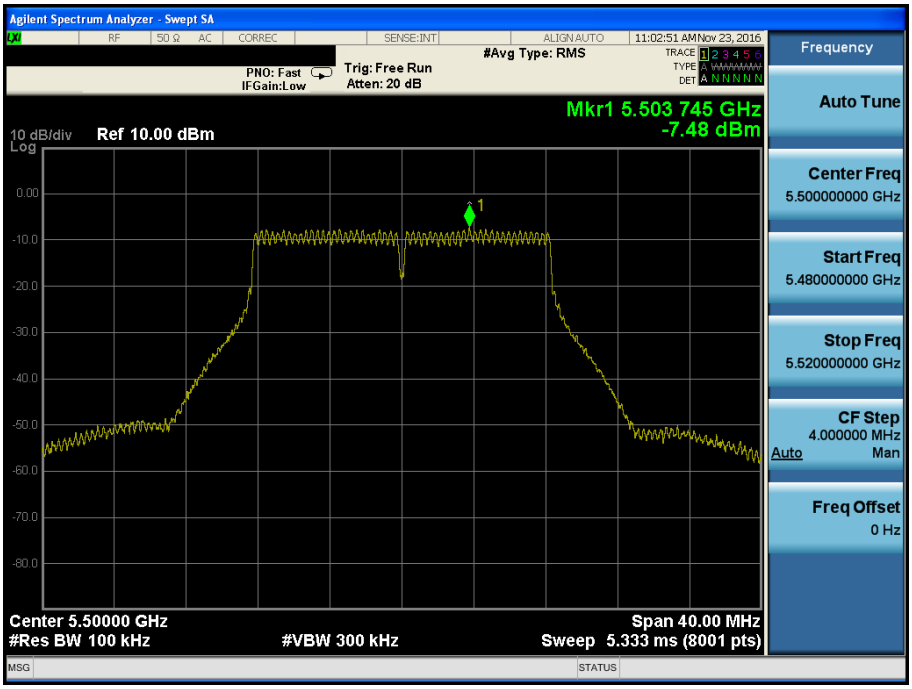


Maximum Power Spectral Density Test Mode: 802.11a & Ch.64



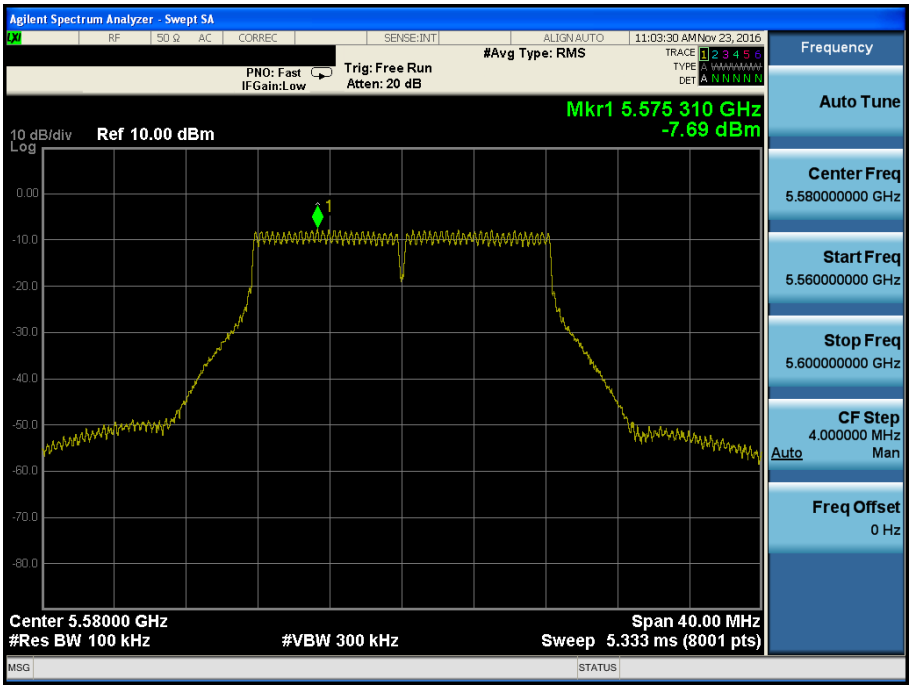
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.100

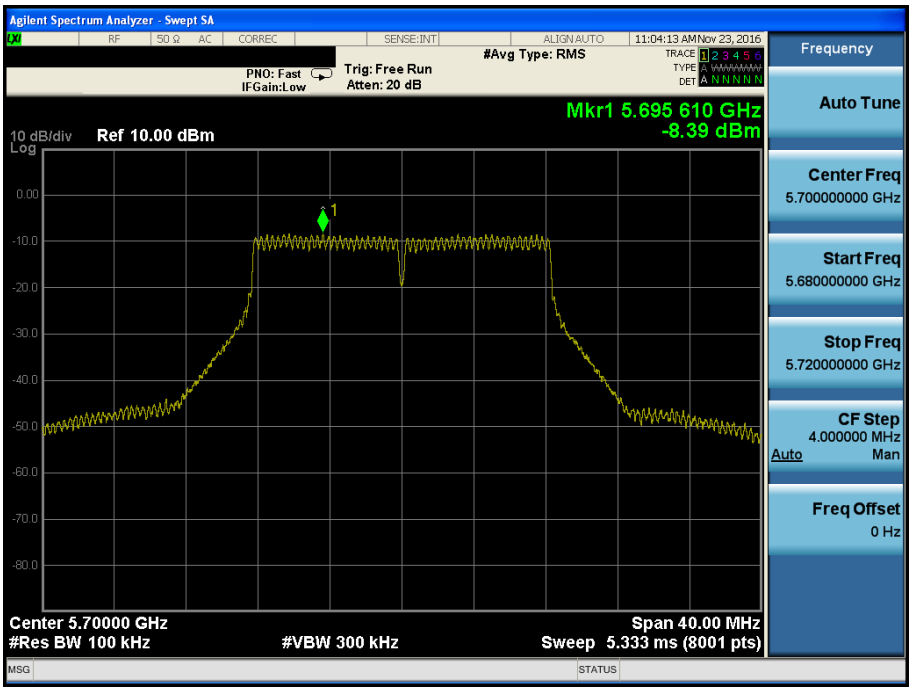


Maximum Power Spectral Density

Test Mode: 802.11a & Ch.116

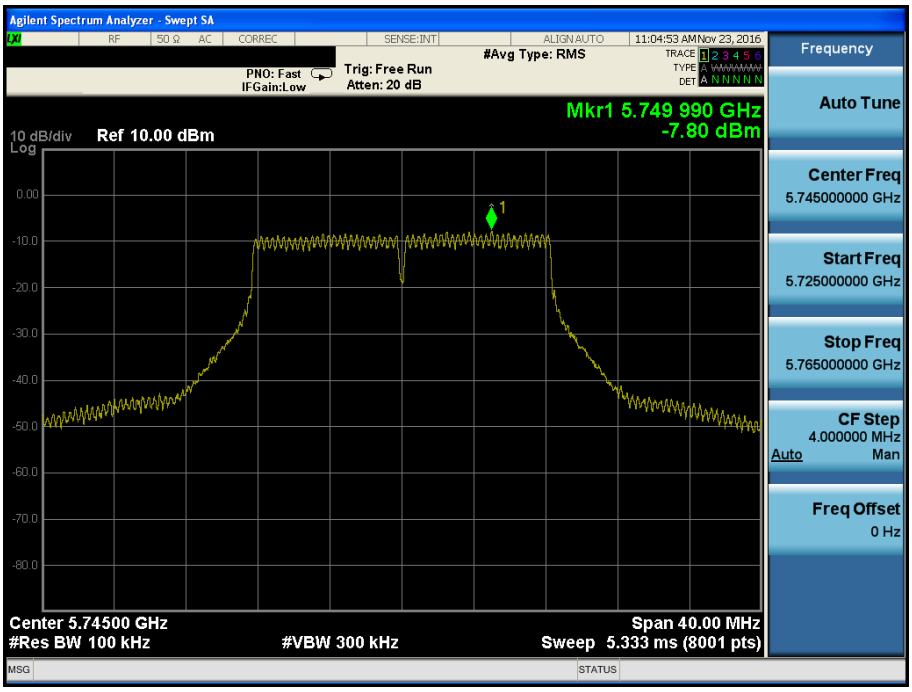


Maximum Power Spectral Density Test Mode: 802.11a & Ch.140



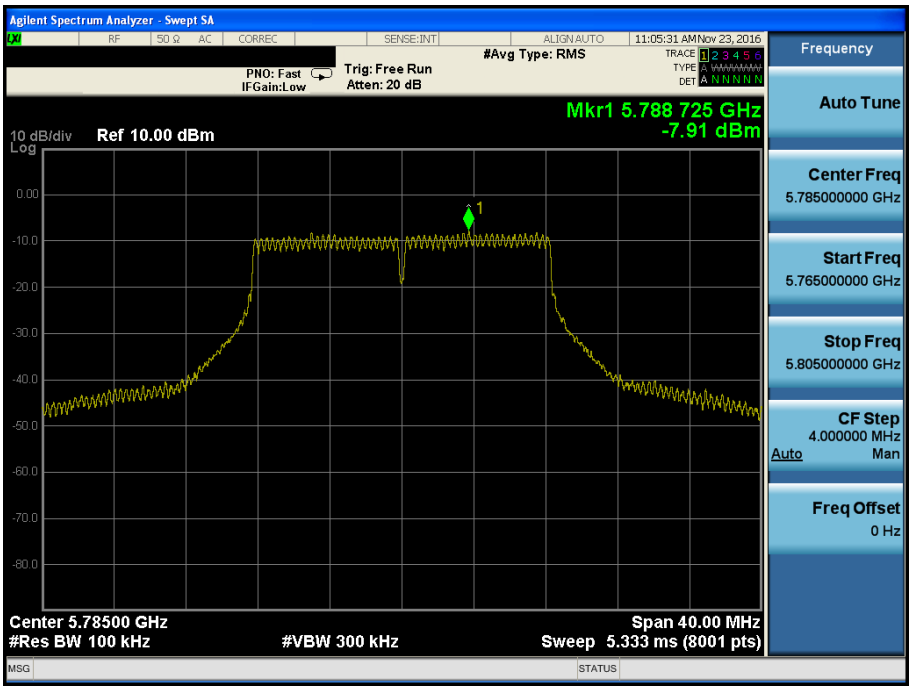
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.149

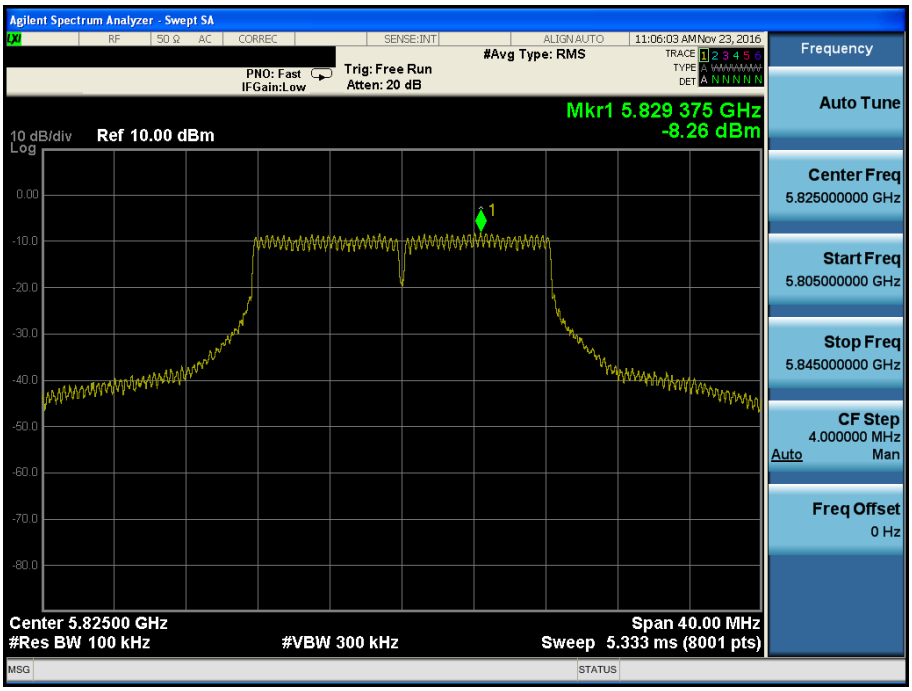


Maximum Power Spectral Density

Test Mode: 802.11a & Ch.157

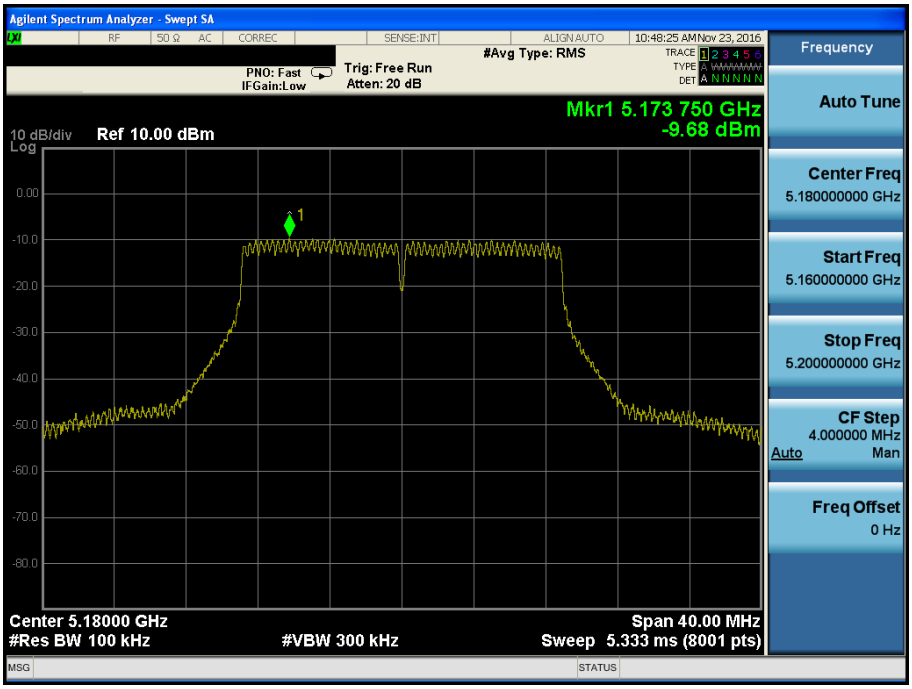


Maximum Power Spectral Density Test Mode: 802.11a & Ch.165



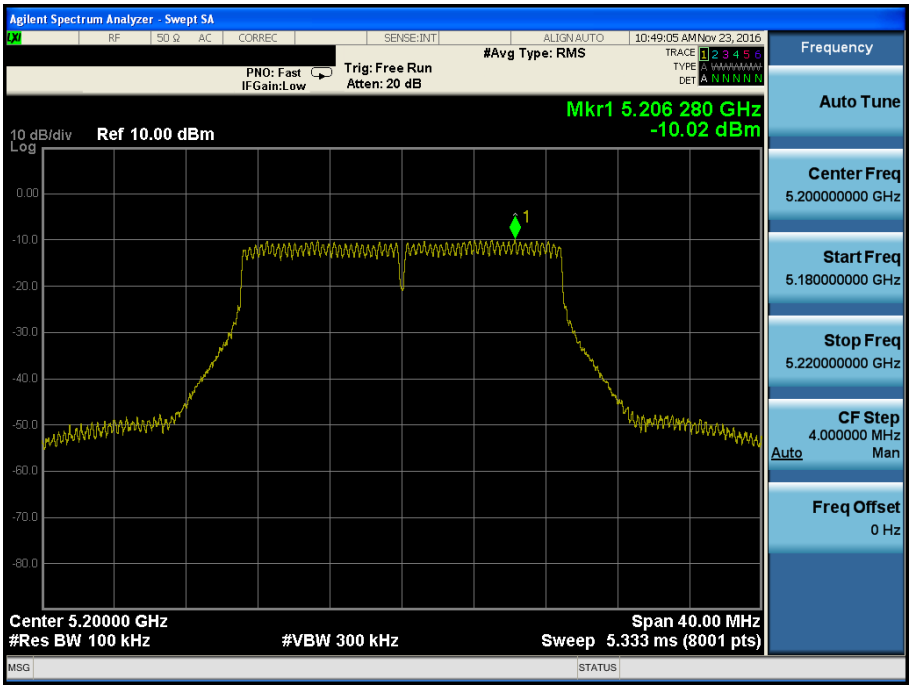
Maximum Power Spectral Density

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

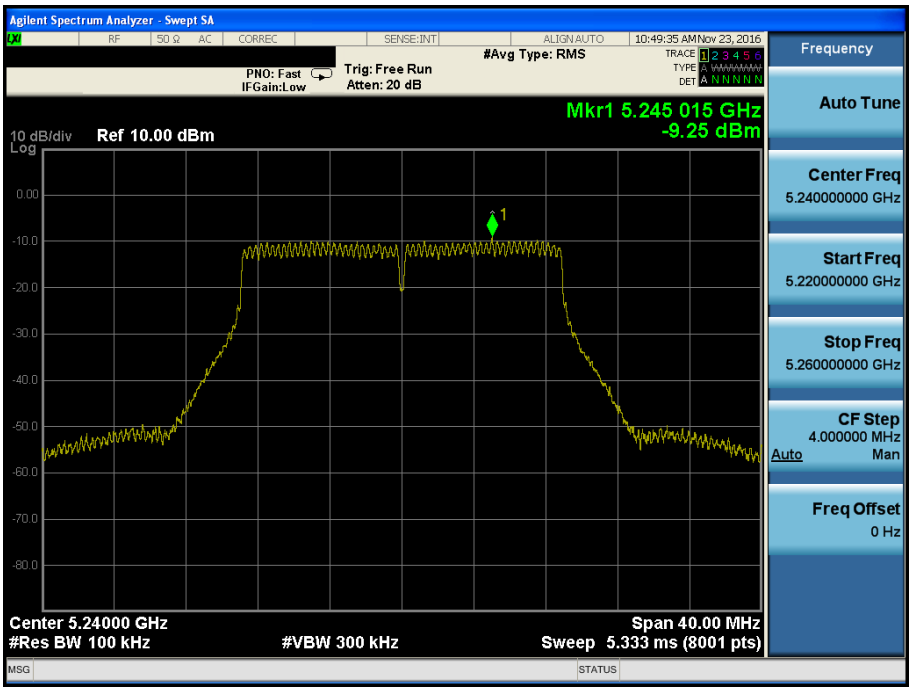


Maximum Power Spectral Density

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

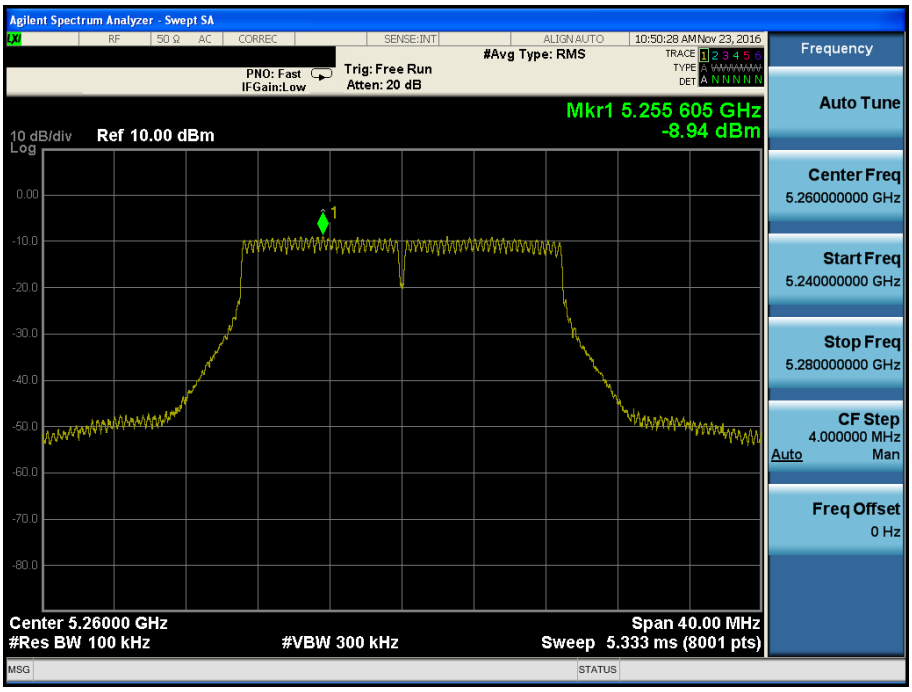


Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.48



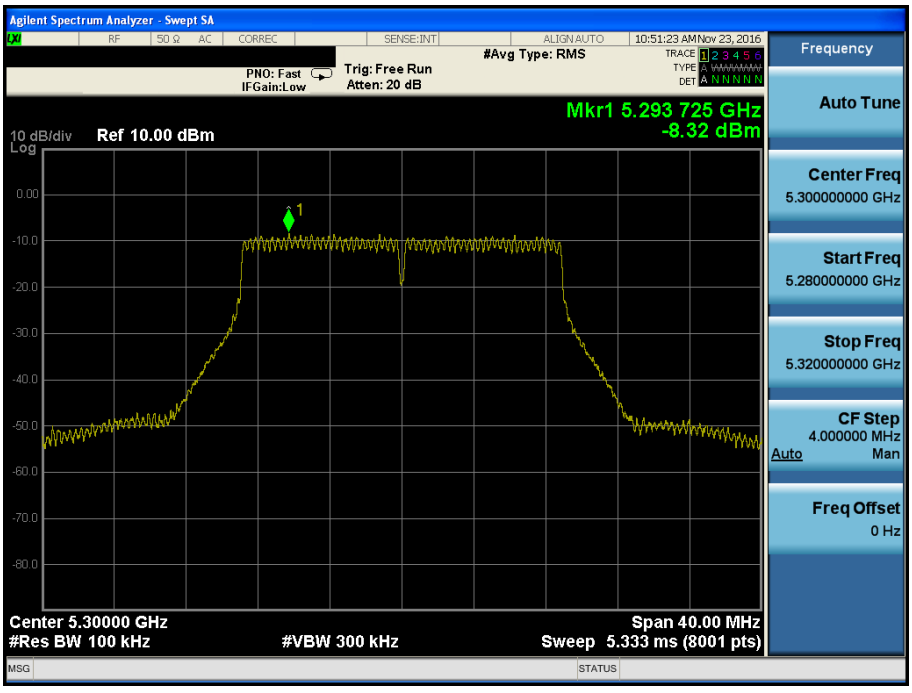
Maximum Power Spectral Density

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

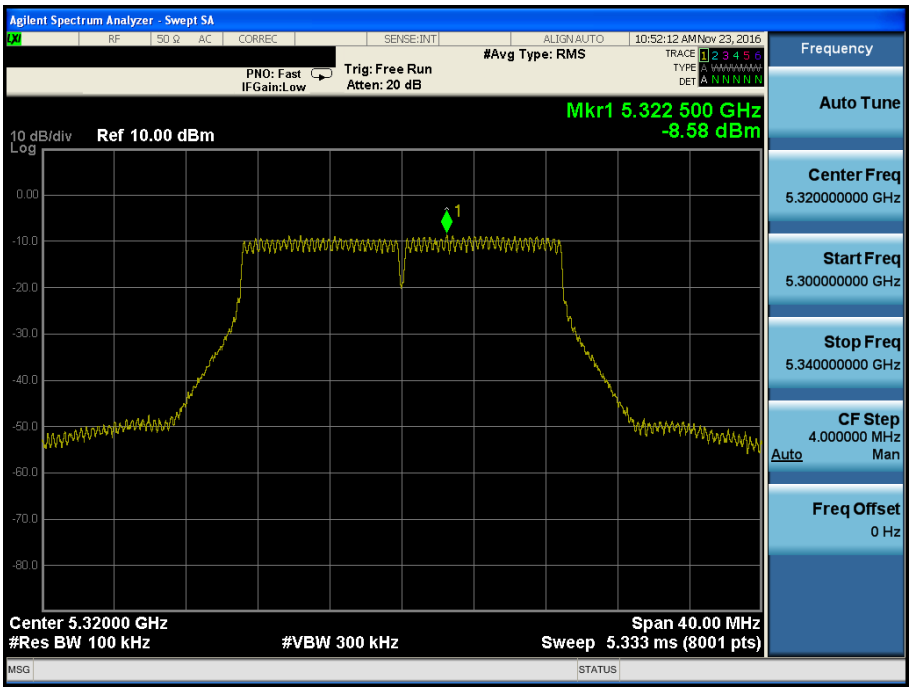


Maximum Power Spectral Density

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

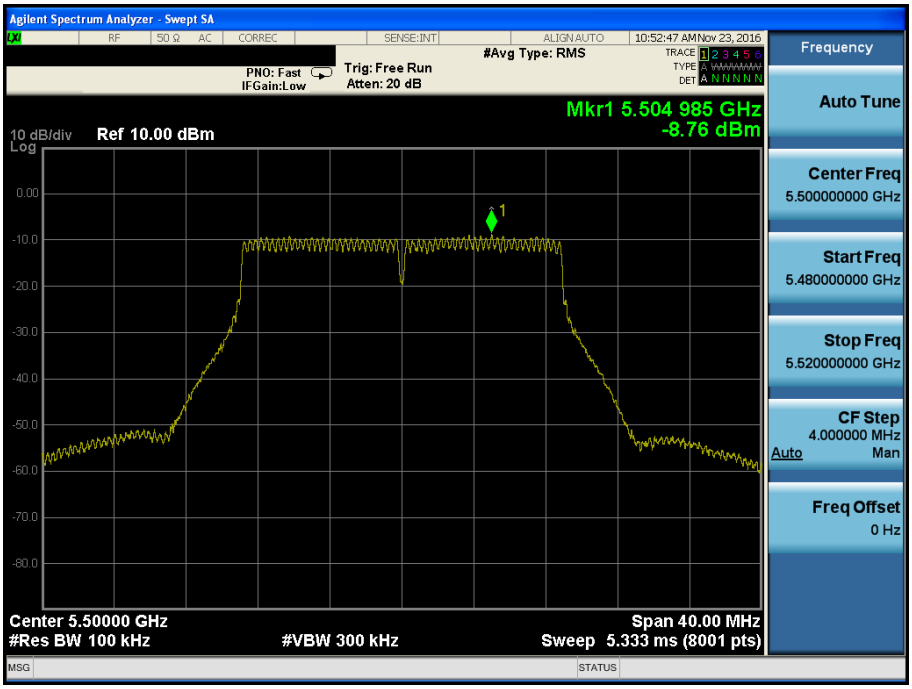


Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.64



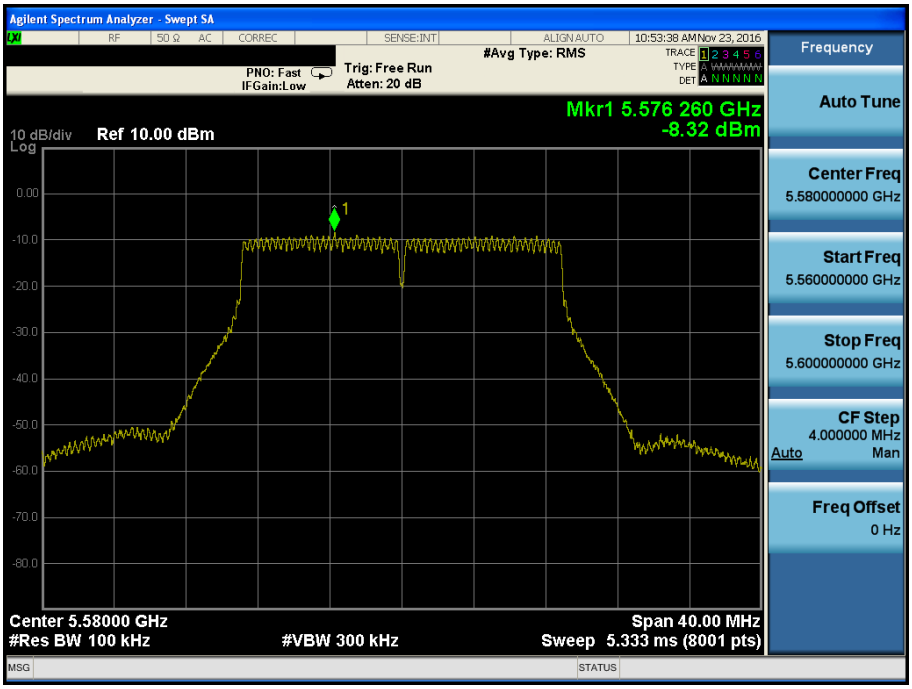
Maximum Power Spectral Density

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

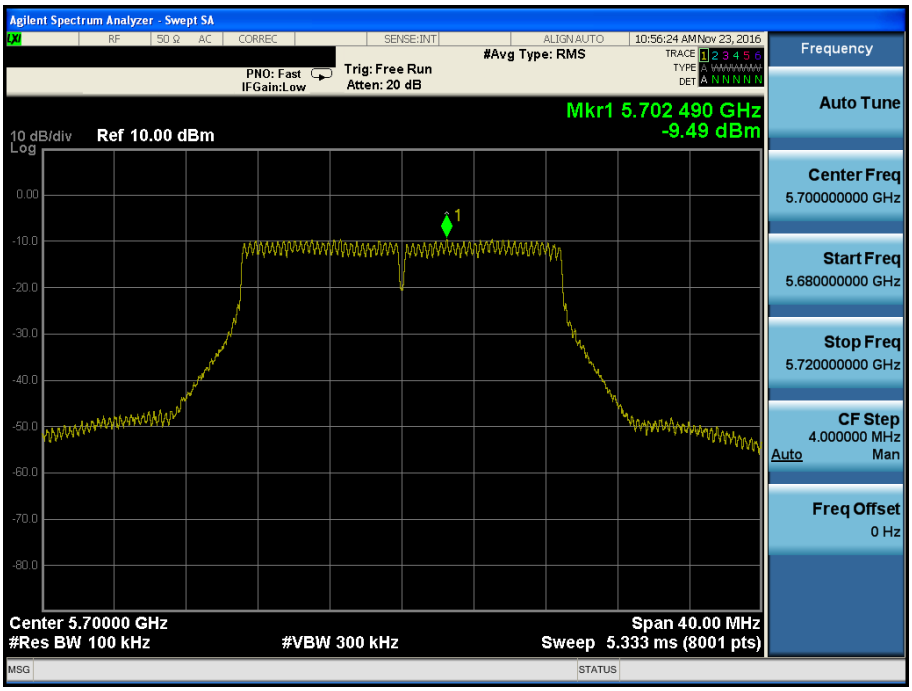


Maximum Power Spectral Density

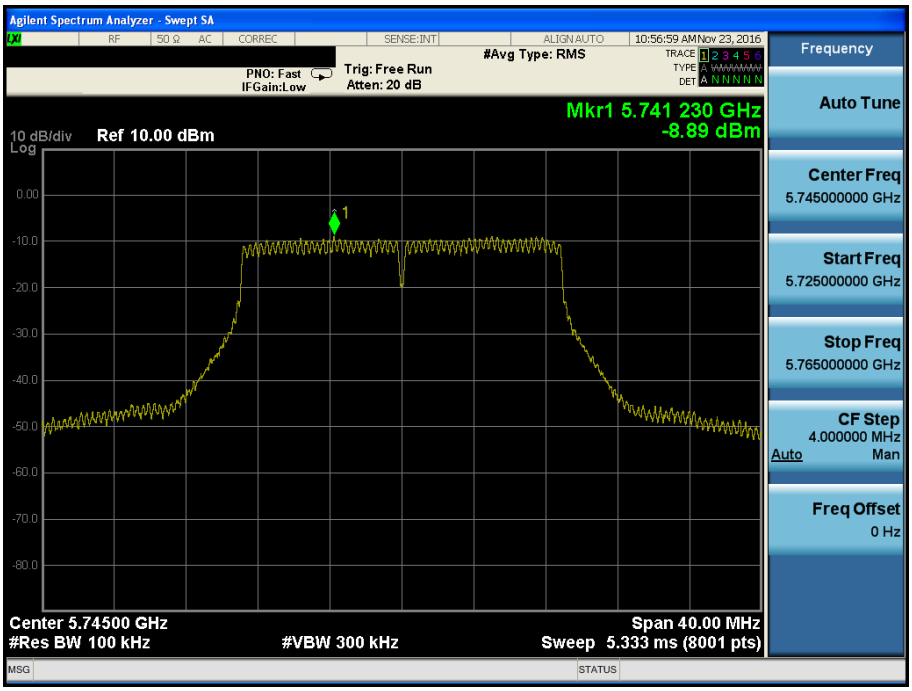
Test Mode: 802.11n HT20 & Ch.116



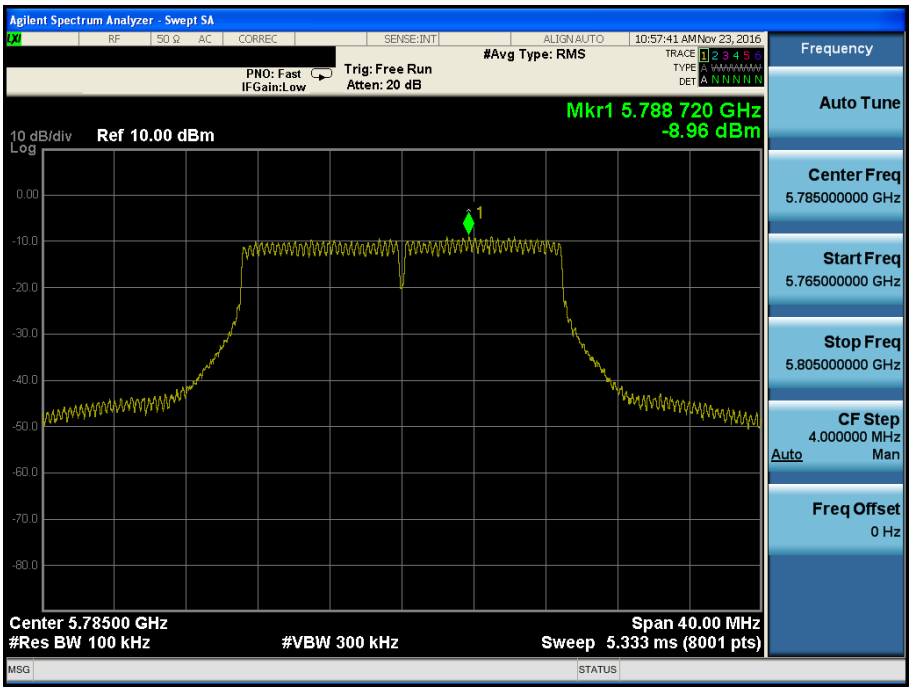
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.140



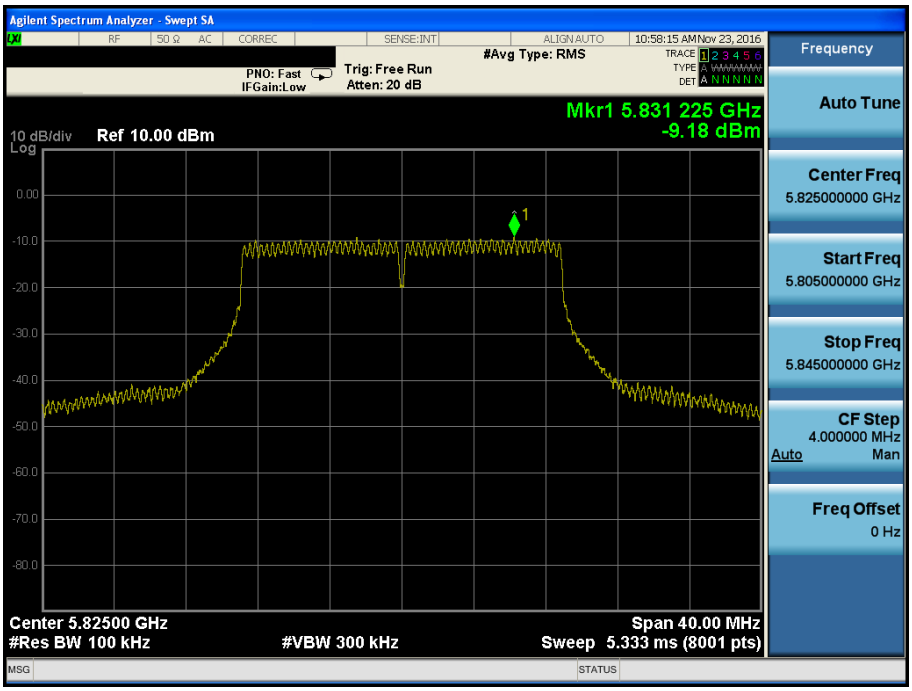
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.149



Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.157

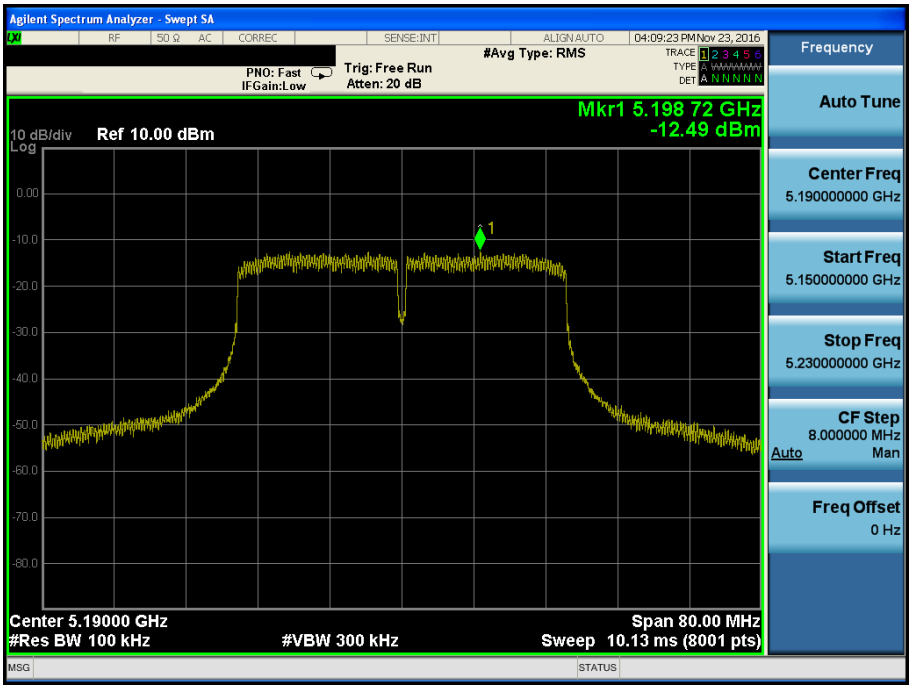


Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.165



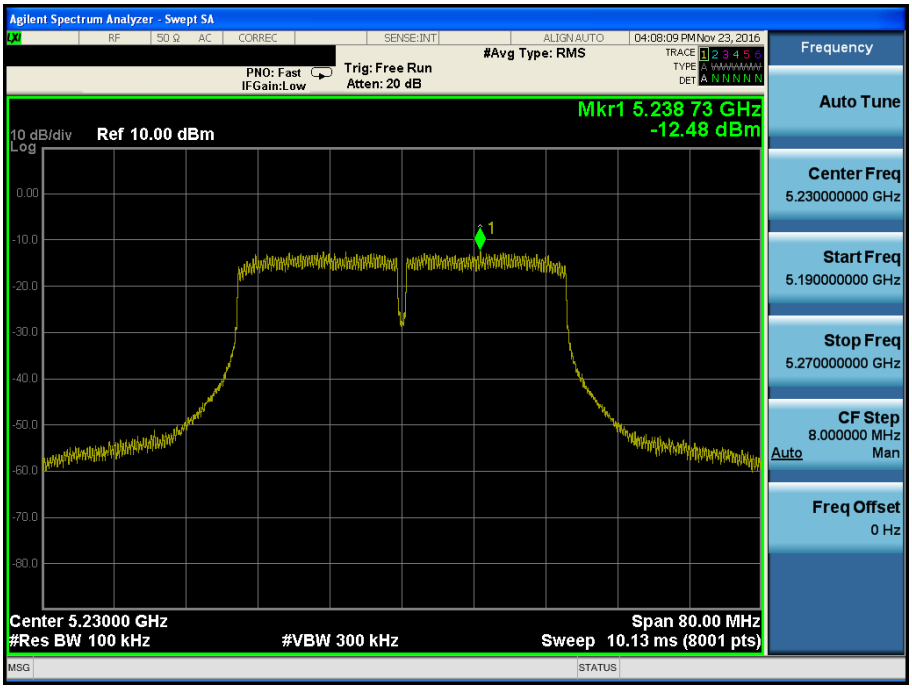
Maximum Power Spectral Density

Test Mode: 802.11n(HT40) & Ch.38



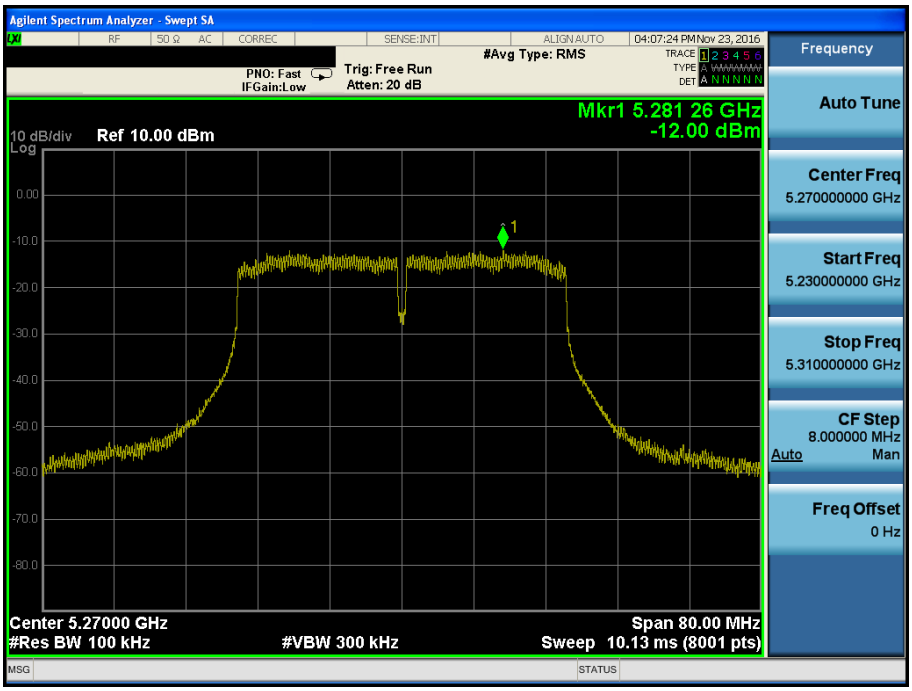
Maximum Power Spectral Density

Test Mode: 802.11n(HT40) & Ch.46



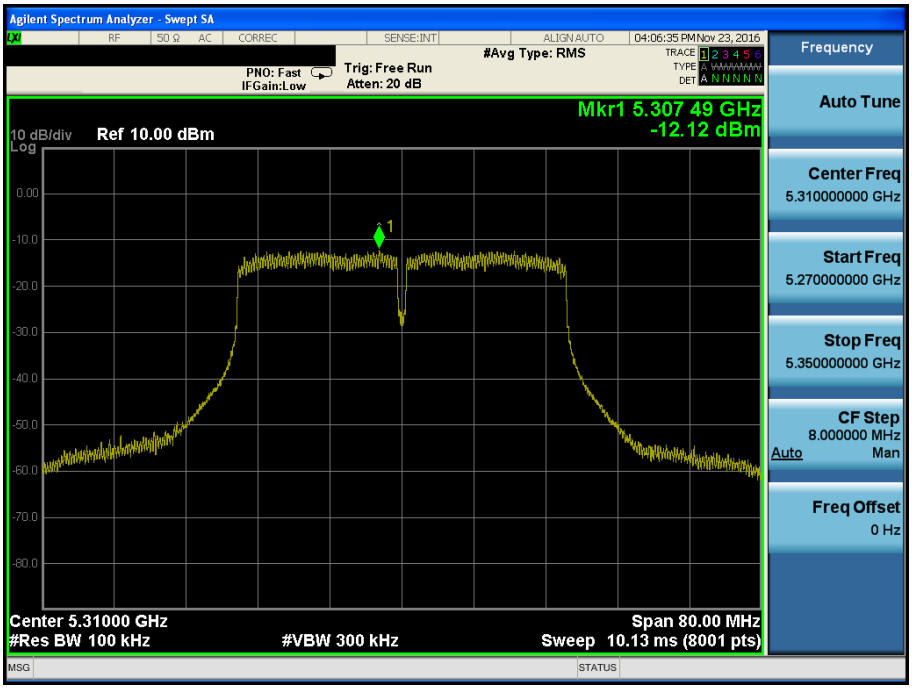
Maximum Power Spectral Density

Test Mode: 802.11n(HT40) & Ch.54

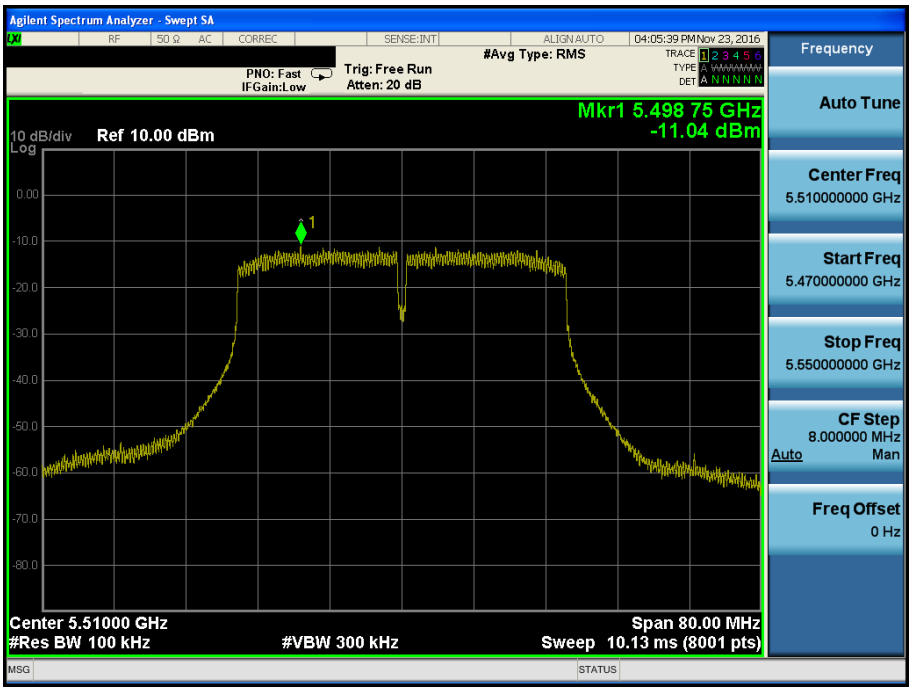


Maximum Power Spectral Density

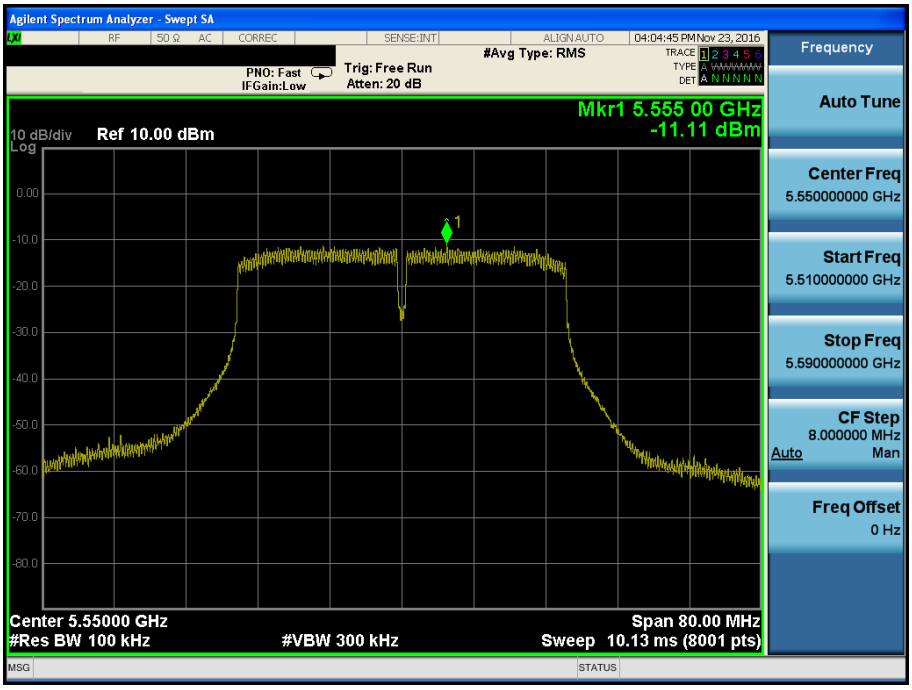
Test Mode: 802.11n(HT40) & Ch.62



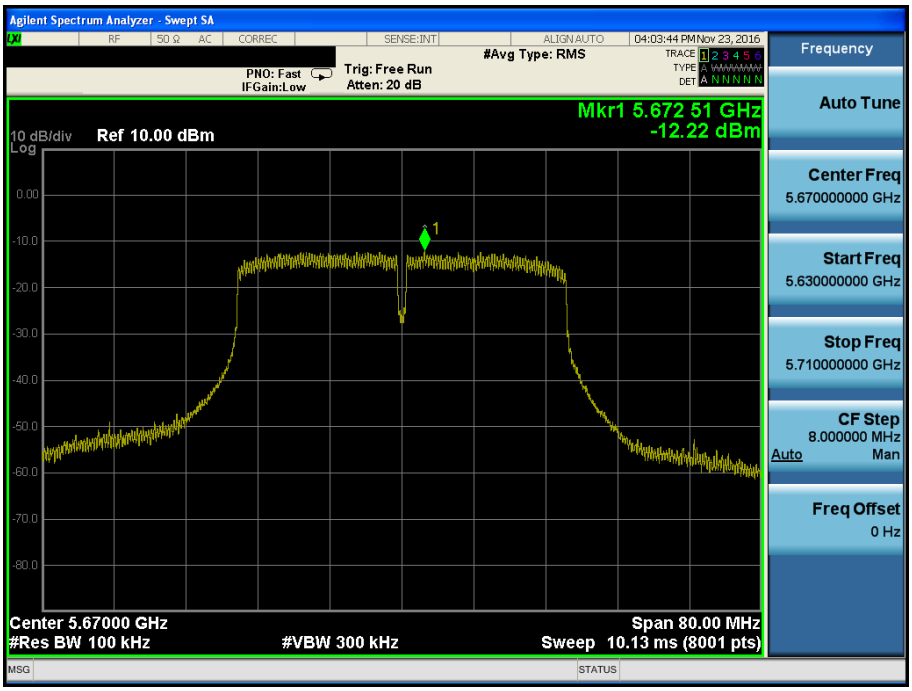
Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.102



Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.110

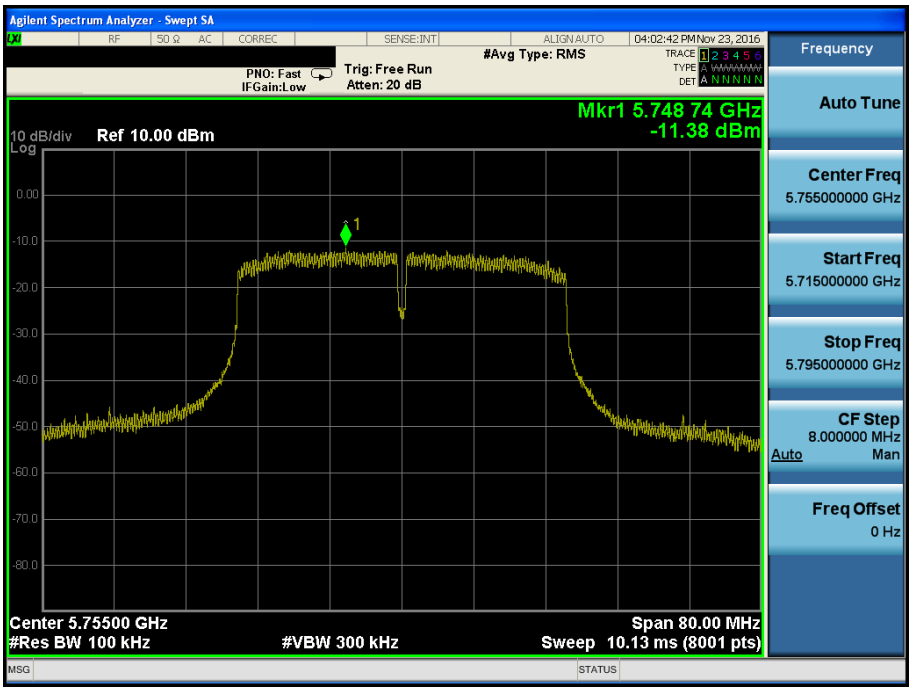


Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.134



Maximum Power Spectral Density

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



Maximum Power Spectral Density

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